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ABSTRACT

A project constructed a Computer-based Test Development Center (COMBAT). It involved the development of instructional objectives and test items and their storage in a computer system from which they could be available to teachers. Project record data, questionnaires, and interviews were used to determine if the objectives were achieved, what the strengths and weaknesses of the system were, and how efficiently the project was run. Evaluation yielded the following results. 1) A pool of 32,000 items was developed, but greater depth and breadth were required. 2) Retrieval costs were too high. 3) The user communication system was effective. 4) In-service training and information dissemination were inadequate. 5) No evidence was obtained which showed a direct effect upon improving instruction. 6) Teachers needed to realize that COMBAT was only emergent, not completed. 7) The management of the project was good. In summary, the project was moderately successful. It showed a computer-based test development center could be built, but not that it effectively improved instruction. Costs must be lowered, the item pool expanded, and teachers better informed about the system. (LB)

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A Title III Project

EM

COMPUTER BASED TEST

Development
Center

COMBAT Evaluation Report

Don Clayton, Project Director

Evaluation Unit

TEACHING RESEARCH

a Division of the Oregon State System of Higher Education

Monmouth, Oregon

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Independent Evaluation Report

COMPUTER BASED
TEST DEVELOPMENT CENTER

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July, 1970

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I. THE PROJECT AND THE CONTEXT OF THE EVALUATION

A. OVERVIEW OF THE PROJECT

The original concept for the development of a Computer-based Test Development Center was developed by key professional educators and researchers in the metropolitan area of Portland, Oregon, and Teaching Research--a Division of the Oregon State System of Higher Education. This group received a planning grant from the Elementary and Secondary Education Title III project office in the fall of 1965. After considerable planning and negotiation, this group obtained a Title III project grant in July of 1967 to develop a Computer-based Test Development Center (COMBAT). The project was designed to service schools in the Portland metropolitan area which consisted of the Portland Public School District and approximately 70 additional districts in Multnomah, Clackamas, and Washington Counties--the three counties surrounding the city of Portland. The schools in this area have formed the Metropolitan Area Testing Program Board in an effort to improve measurement of student characteristics and performance and curriculum evaluation procedures. On the basis of mutual agreements between the agencies involved in the planning and the funding agency, the Multnomah County Intermediate School District was designated as the primary grant recipient. The assistant superintendent for the Multnomah County I.E.D. was designated as project director.

To facilitate the development and implementation of the project, the Multnomah County I.E.D. let two subcontracts. The first was for the development of the computer storage and retrieval system and for the

operation and maintenance of the storage and retrieval system. The Portland Public Schools' computer center was the subcontractor for this activity. The second subcontract was let to Teaching Research for development of the test items and objectives to be stored in the computer system and for maintenance of communication between the agencies cooperating in the project.

The overall purpose of the COMBAT project was to provide the test development and production service to classroom teachers. This service was considered valuable because a typical testing program consisting of teacher-made tests, published or standardized tests, and locally developed tests, had deficiencies. These tests often lacked technical quality, were of limited range in usefulness with small groups of students, or were not relevant to the content taught in the district. By using the large number of teachers as a source for test items, the project was to develop a pool of quality test items and objectives that would be available to individual classroom teachers for testing and planning purposes. The project leaders also hoped to provide a quality service that would result in teachers using tests in a more diverse manner and for a wider variety of reasons, such as diagnostic testing, pretesting, and individualizing instructional programs.

In order to achieve the overall purpose of the COMBAT project, large numbers of validated test items and instructional objectives were to be stored in a computer. Teaching Research had the primary responsibility to assist teachers in writing objectives and test items for inclusion in the item pool. Project plans called for the selection

of a limited curricular area and limited grade level for initial item and objective development. During later stages of the project the curricular areas and the grade levels would be expanded.

There were five general tasks for the project staff: 1) developing statements of objectives which encompassed the selected curriculum, 2) obtaining items designed to measure particular objectives, 3) storing test items and objectives in a computer data bank, 4) organizing a system of communication between teachers and the COMBAT facility, as well as disseminating relevant information to the classroom teachers, and 5) producing, on demand, objectives and test items in an acceptable form from teachers in a reasonably quick turn-around time.

Classroom teachers were invited to participate in a variety of in-service and workshop programs in the production of test items and objectives. These activities included evening and weekend workshops, summer workshops, and extended workshops during the academic school year. Teachers were also invited to contribute samples of the tests they used with their students as a basic source for test items and objectives. The delivery system developed by the Computer Center consisted of a two-step, telephone-mail procedure. Teachers made an initial contact with the COMBAT center by telephone and requested test items on specific curricular areas for particular grade levels. A computer printout of the objectives and test items was mailed to the teachers. The second step required the teachers to contact the Computer Center by phone a second time to identify specific items for a test. These items were then prepared by the computer into a test ditto which was mailed directly to the classroom teacher.

During the first half of the three years of the project, the major developmental effort was limited to the identification and production of test items and objectives in the Social Studies for grade levels four, five, and six. During the later stages of the second year and during the third year of the project, the developmental effort expanded to include grade levels four through twelve, in four curricular areas: Social Studies, Language-Arts, Mathematics, and Science.

B. PURPOSE OF THE EVALUATION

The primary function of this evaluation report is to fulfill the legal requirements for a summary evaluation report as required of all Title III projects. It is also designed to provide formative information for the project consortium and other interested parties who may intend future development of computer-based testing programs.

The expected audiences for this report fall into three categories: (a) ESEA Title III administrative agencies, (b) the consortium of project agencies; (c) developers of similar programs and other educational innovators. The administrative agencies of the Title III program include the U.S. Office of Education and the State of Oregon Office of the Director of Title III Project. The contents of this evaluation should provide information that will be useful to these agencies in completing their annual reports. It also contains information that may be used by these agencies in future decisions regarding funding of Title III projects. The consortium of project agencies includes the County I.E.D. offices for Multnomah, Clackamas, and Washington Counties within the state of Oregon, and the Portland Oregon School District. The other cooperating agencies are the Metropolitan Area Testing Program Board, Teaching Research Division of the Oregon State System of Higher Education, and the Portland School District

Computer Center. Although each of the cooperating agencies will use the information in different ways, all of them will find aspects of the report that relate to the accountability criterion that are beginning to emerge in the educational research environment. In addition, an effort was made to identify some of the requirements for developmental efforts that are field centered or directly involve classroom teachers. Outside observers, such as developers of similar projects and other educational innovators, will find portions of this evaluation directly related to their planning efforts for field-centered developmental work.

In order to serve these diverse purposes the evaluation was designed to answer three categories of questions. First, did the project attain its objectives as stated in the original and continuation proposals? Second, as perceived by teachers, school district testing representatives, and project personnel, what were the strengths, weaknesses, and greatest potentials of the COMBAT program? Third, as perceived by project representatives from each of the primary agencies associated with the COMBAT project, how effective and efficient were the project operational procedures and project management? The data sources used in this effort include: (a) project record data, (b) field-tested questionnaires for the general teacher population served by the project, teacher users of the COMBAT system, and school district testing representatives, (c) telephone and personal interviews with key staff in the project consortium.

II. DATA COLLECTION AND ANALYSIS PROCEDURES

A. SOURCES OF DATA

Record Data: Project record data served two basic functions. First, portions were used in the direct evaluation of the attainment of project objectives. Second, some records led to the construction of questionnaires and interview guides used with teachers and other key project personnel. The following list describes the major record data that contributed to the evaluation:

1. Record of teacher users, by name and code number, indicating the number of first requests and the number of second requests made by each individual. A first request was defined to be an initial contact by a teacher for an individual list of objectives or test items. A second request was defined as a request for a test ditto of test items selected from the initial listing of test items. Thus a teacher who made two distinct inquiries regarding separate topics but failed in either case to request a test ditto was recorded as having made two first requests and no second requests. At the same time, a teacher who made two separate inquiries on different content areas but requested a test ditto for only one of those areas was recorded as making two first requests and one second request.
2. A list of in-service programs conducted by the COMBAT staff. This data included a list of the names of the participants in each of the in-service programs and a statement of the objectives for each program.

3. The monthly reports, tabulated by the Computer Center, indicating the number of test items and objectives stored in the item bank, and the number and type of teacher requests made during that month.
4. Copies of keyword indexes made available to teachers in the area serviced by the project.
5. A list of the school districts included in the service area.
6. A list of the agencies cooperating in the consortium and the key personnel associated with the project from each of those agencies.
7. A description of the project functions designated for each of the participating agencies. This description was contained in the subcontracts let by the primary contracting agency, the Multnomah County Intermediate School District.
8. Samples of objectives and test items contained in the item bank.
9. Copies of journal articles, presentations made at professional meetings, and other reports produced by the project staff.

Questionnaires: Three questionnaires were developed by the evaluation staff. The first questionnaire was designed for the general teacher population served by the COMBAT project. Items for this questionnaire were developed by the evaluation team on the basis of the record data and initial interviews with project staff. After the first form of this instrument was developed four members of the evaluation team visited four elementary and four secondary schools to field test the instrument with a sample of teachers in those buildings. The number of teachers included in this field test at each school varied from two through five. The instrument was revised on the basis of the teacher

response to the items and their comments regarding the format and content of the instrument. A copy of the final form of this general questionnaire is included in the Appendix.

A second questionnaire, COMBAT Users' Questionnaire, was developed and field tested in a manner similar to that of the general questionnaire. This instrument was used with teachers who had used the COMBAT system. It differed from the general instrument in length and in form. The major difference in form was the inclusion of five open-ended questions. A copy of this instrument is included in the Appendix.

The third questionnaire was designed for administration to the testing representatives from districts served by the project. This instrument was composed exclusively of open-ended items. A sample of the questionnaire is included in the Appendix.

In addition to the three questionnaires, interview schedules were developed for use with key project personnel such as the members of the Teaching Research staff, members of the Advisory Board to the project as designated by the Metropolitan Area Testing Program Board, and the project personnel at the Portland School District Computer Center.

B. SAMPLING PROCEDURES

General Teacher Questionnaire: Two general problems were associated with the distribution of the general teacher questionnaire. First, the project service area included a total of 266 elementary schools and 64 secondary schools. Second, there was no complete list or frame of the teachers in each of these schools distributed in four regions, Multnomah County, Washington County, Clackamas County, and Portland. Since the project was directed toward grades four through twelve in four curri-

culum areas, it was decided that the sampling procedures for the elementary and secondary schools should be handled differently.

The elementary schools in each of the three County Intermediate Education Districts and the Portland Public Schools were each assigned a number. The schools in the four areas were numbered separately. Through the use of a random number table, a 15 percent sample of schools was randomly selected independently in each of the four areas. That is, four independent 15 percent random samples of school buildings were selected. The school directories published by each of the four areas served as an indicator of the number of teachers in each building.

In order to obtain an adequate representation from each of the four curriculum areas in the secondary schools a separate procedure was needed. Each secondary school in the three County Districts and Portland Public Schools District was assigned a number. Fifteen percent of the schools in each of these four areas was randomly selected and assigned to each of four curriculum areas. That is, 15 percent of the schools in Portland Public Schools were assigned to English, 15 percent to math, 15 percent to language-arts, and 15 percent to social studies. No school was assigned to more than one curriculum area. A similar technique was used for each of the County Intermediate School District regions. On the basis for the information published in the school directories, an approximation of the number of teachers in each department within those schools was identified. In this manner the sample included 15 percent of the teachers from each region in each of the four secondary curriculum areas. It should be noted that in both the elementary and secondary school samples for the general questionnaire, individual teacher names could not be identified. Rather, the samples were taken on a

school basis for the elmentary level and on a department basis for the secondary level.

COMBAT Users' Questionnaire: The Portland Computer Center supplied a list of the names and school buildings for every teacher that had made a formal request for test items or objectives. This list served as the sampling frame for the teacher users' questionnaire. A 25 percent random sample was selected from the list of users in each of the four regions; Portland, Multnomah County, Washington County, and Clackamas County.

No sampling procedures were required for distribution of the school district testing representives questionnaire nor the interviews with the MAPTB COMBAT Advisory Board. Every testing representative was mailed a questionnaire and each member of the Advisory Board was interviewed.

C. DATA COLLECTION PROCEDURES

Record Data: The record data were obtained through the Teaching Research COMBAT Project Coordinator. This procedure proved to be very satisfactory in most all cases. The major difficulty resulted in the type of record data sought by the evaluators and the availability or existence of specific types of records.

General Questionnaire: The distribution and return of the general questionnaire was handled in a cooperative effort by the evaluators and the Intermediate Education District offices. An approximation of the number of teachers in each of the schools selected in the sample was obtained from the I.E.D. school directories. For each school, a packet was developed that included separate teacher envelopes containing an introductory letter and the questionnaire. These envelopes were packaged by school along with a letter of instructions for distribution to the teachers. The packets intended for the schools in each of the County

Intermediate Districts and Portland Public Schools were boxed separately. Each box was distributed to the appropriate I.E.D. office or to the Portland Public Schools Central Research Office. The responsibility for distribution of the individual school packets rested with the County Intermediate Districts and the Portland Public Schools Central Office. Once a packet was delivered to a school, the building principals had the responsibility to distribute the individual teacher envelopes to the appropriate personnel. The questionnaires were filled out and returned to the school principal who in turn packaged and returned them to the central collecting agency, that is, the County Intermediate Districts or the Portland Public Schools Research Office. In the case of the secondary schools the school packets were identified by department and the principal either distributed the individual teacher questionnaire packets himself or worked through the department chairman.

Because an exact count of the number of teachers in each of the sample schools was not available, it is impossible to calculate an exact percentage of questionnaires that were returned. On the basis of the number of questionnaires sent out and the number of questionnaires returned, it is estimated that approximately 50 percent of the teachers responded.

Teacher Users' Questionnaire: A teacher packet was prepared for each teacher in the sample. It contained a questionnaire and a letter that introduced the purpose of the questionnaire and the procedure for returning the document. Each envelope was addressed to a specific teacher by school building and district in which that teacher was working when he made the initial request. The packets were collated by school building and then by district and county. The county packets were distributed to the County

IED offices and the Portland Public Schools Research Office. These agencies distributed the packets to individual schools and the principal was responsible for distributing the individual teacher envelopes to each member of the sample. After completing the questionnaires, the teachers returned the questionnaires to the school principals who in turn sent them on to the County IED offices where they were collected by the evaluation staff. In a few cases teachers that were included on the list of users were no longer teaching in the school building or district. Because these teachers could not be identified, it is difficult to calculate an exact return percentage. A total of 118 users' questionnaires were distributed and 42 were returned, a 35 percent return rate. It is estimated that the return percentage, after taking into account teachers that were no longer in their respective school buildings, approached 50 percent. The procedures for making this estimate are described in the data analysis section.

D. DATA ANALYSIS PROCEDURES

The data analysis procedures for record data, interviews, and questionnaire responses are discussed in detail in the data analysis section. In general these procedures included a computer item response tabulation for the questionnaires, and coding of interview responses from typed transcriptions. The procedures for analyzing record data varied depending upon the nature of the data. The interviews obtained from the project personnel and from members of the Advisory Board to the COMBAT project from the Metropolitan Area Testing Program Board were either taped during the telephone interview or taped during personal interview.

III. REPORT OF DATA RELATED TO PROJECT OBJECTIVES AND OPERATIONS

During the first two years the project activities were directed toward the attainment of six general objectives. These objectives centered on the development, design, and implementation of a field-centered, computer-based testing service. In the third year, the project concentrated on four specific objectives focused on expanding in the development of the test item bank and increasing teacher use of the system.

In order to make the report for the evaluation data maximumly useful to the reader, the data analysis is divided into five sections. The first section describes the demographic characteristics of the respondents to the teacher questionnaires. The remaining four sections report the data that are directly related to the objectives of the first two years, the objectives of the third year, project management, and perceived project potentials.

A. DEMOGRAPHIC CHARACTERISTICS OF THE TEACHER QUESTIONNAIRE RESPONDENTS

The degree to which the respondents represent the total population is a critical concern in the interpretations of questionnaire data obtained through the mails or similar delivery system. It is doubly difficult to address this issue in the current report since no adequate description of the general teacher population or the teacher user population was available. To help establish the credibility of the data reported herein, it was deemed necessary to collect and report a limited amount of demographic data from each respondent. Tables 1 and 3, respectively, contain a summary of teacher responses to six demographic

questions on the teacher users' questionnaire and the general teacher questionnaire.

Two items of record data were available as referents for the data presented in Tables 1 and 2. The first is a tabulation of the grade levels included in the code number assigned to each teacher user. This grade level corresponds to the grade level of the test items requested by each teacher user on his initial contact with the COMBAT system. A tabulation is presented in Table 2. The second referent is a tabulation of the number of teachers assigned to each grade level in the school districts serviced by the Multnomah County Intermediate Education District during the school year 1969-70 (see Table 4).

The data in Table 2 can be compared with the data contained in row five of Table 1. That is, the data headed by "grade level of the majority of your students." It can be seen from Table 1 that 72 percent of the teachers responding to the users' questionnaire taught in grade levels one through six, whereas data in Table 2 indicate that 64 percent of the users' had ID numbers associated with grade levels one through six. In a similar manner, it can be noted that 28 percent of the questionnaire respondents indicated they taught in grade levels nine through twelve, whereas 36 percent of the teacher ID numbers were associated with grade levels nine through twelve. Although this evidence is tenuous, it does indicate that respondents to the teacher users' questionnaire nearly approximates the grade level percentage breakdown as recorded on the teacher users' ID numbers.

Four of the items contained in Table 1 need further examination. First, it should be noted that the breakdown of the sex variable as reported in Table 1 does not represent a consistent proportion by grade

TABLE 1

Demographic Characteristics of
Respondents to Users' Questionnaire

Sex	36% 15 Male	64% 27 Female					
Age	24% 10 20-30	29% 12 31-40	19% 8 41-50	22% 9 51-60	5% 2 61-over	1 N.R.	
College Training (degree & term hrs.)	19% 8 B.S.	24% 10 BS+20	22% 9 MS or BS+45	19% 8 MS+20	13% 7 MS+45	0 N.R.	
Major Teaching Assignment	57% 24 Self-Contained	2% 1 Science	2% 1 Soc. Studies	8% 3 Math	10% 4 Lang. Arts	24% 10 Other	0 N.R.
Grade level of majority of students you teach	12% 5 1-3	60% 25 4-6	10% 4 7-9	2% 1 9-10	5% 2 9-12	12% 5 11-12	0 N.R.
Grade levels included in your school	67% 28 1-6	8% 3 6-8	5% 2 7-9	5% 2 9-12	14% 6 10-12	1 N.R.	

TABLE 2

Grade Level of Teacher Users' I.D. Number

Grade level	4% 20 1-3	60% 282 4-6	24% 112 7-9	12% 56 10-12

level. In grades one through six the percentages were approximately 30 percent male and 70 percent female. Whereas in grades seven through twelve the percentages were approximately 60 percent male and 40 percent female. Second, the age distribution of teachers in grade levels one through six was approximately equally divided over the ten year age spans from 20 through 60; that is, approximately 20 percent in each of the four ten year spans. On the other hand, the teachers in grade levels seven through twelve concentrated in the age span 31 through 40 with 50 percent of these teachers in that age category. Third, approximately 50 percent of the teachers in grade levels one through six had received no more than their Bachelor's plus 20 hours of college training. In grade levels seven through nine, 75 percent of the teachers reported they had received at least a Master's degree. Lastly, it should be noted that all of the teachers who indicated they taught in self-contained classrooms were teachers in grade levels one through six. Five of the ten teachers who indicated their major teaching assignment as "other," taught at grade levels one through six.

Table 4 describes the distribution of teachers by grade level in school districts served by the Multnomah IED during the 1969-70 school year. Under the assumption that the school districts serviced by the COMBAT project have a distribution of teachers by grade level that is approximately similar to that represented in Table 4, we can compare Table 4 with the fifth row of Table 3. In making this comparison two points should be kept in mind. First, the directions for the distribution of the general questionnaire, instructed the principals to distribute the questionnaire only to teachers in grade levels four through six, and to

teachers in the four academic areas for which items were included in the item bank. Secondly, the information contained in Table 4 includes all secondary teachers; that is, those assigned to the four academic areas corresponding with the project activities as well as those in other curricular areas. On the basis of these last two points, it could be expected that the percentages of teachers in the lower grade levels responding to the general questionnaire would be slightly higher than the percentages recorded in Table 4. Likewise, the percentages of teachers in the secondary grade levels responding to the general questionnaire would be slightly lower than the percentages recorded in Table 4. By examining Table 4 and the fifth row of Table 3, it can be seen that these expectations were fulfilled. Although this information is very sketchy at best, it does help to indicate that there was no gross systematic bias in the return of the general questionnaire on the basis of grade level. This last statement is based on the fact that 43 percent of the respondents to the questionnaires taught at grade levels one through six, whereas 31 percent of the teachers in grades four through twelve in Multnomah County taught in grades four through six. Likewise, 25 percent of the respondents indicated they taught in grades seven through nine, whereas a total of 25 percent of the teachers in the Multnomah County area taught in either grades seven through eight or the junior high level (after excluding grades one through three). Likewise, 32 percent of the teachers responding to the questionnaire indicated they taught in grades nine through ten, nine through twelve, or eleven through twelve, whereas 44 percent of the teachers in Multnomah County from grades four through twelve were identified as

teaching in the high school level. A closer examination of the data reported in the first four rows of Table 3 showed trends by grade level that were very similar to those reported for the teacher users' questionnaire.

There are some obvious discrepancies that appear when the data presented in Tables 1 and 3 are compared. These discrepancies are best explained by reminding the reader of the operation of the project. During the first two years the project effort was centered on obtaining objectives and test items for grades levels four through six. Only in the later stages of the project, that is the third year, was a concentrated effort made to expand the item pool to include items for grade levels seven through twelve. It should also be noted that the majority of the effort of the project during the first years concentrated on social studies in the lower grade levels, and that Science, Mathematics, and Language Arts subject area specialists in the higher grade levels were not encouraged to use the system until the third year of the project. With these conditions in mind the discrepancy in the sex variable between the two tables can be explained on the basis of the concentration of female teachers in grade levels four through six. Thus, the teacher users' data indicates a higher percentage of females than indicated in the data from the general teacher's questionnaire. It is not feasible to attempt to analyze any discrepancy between the two sets of data on the college training of the teachers. There was a high percentage of non-respondents to this item on the general questionnaire. This high percent of nonresponse was due to a typographical error in the printing of the questionnaire. Since the general questionnaire was sent to a sample of teachers in all areas serviced by the project at the close of year three,

TABLE 3

Demographic Characteristics of
Respondents to General Questionnaire

Sex	48% 224 Male	51% 243 Female	 5 N.R.				
Age	33% 156 20-30	23% 109 31-40	22% 106 41-50	15% 69 51-60	6% 29 61-over	 3 N.R.	
College Training (degrees & term hrs.)	8% 41 B.S.	28% 128 BS+20	34% 161 MS or BS+45	5% 25 MS+20	5% 27% MS+45	19% 90% N.R.	
Major Teaching Assignment	44% 209 Self-Contained	5% 26 Science	21% 99 Soc. Studies	12% 56 Math	12% 53 Lang. Arts	5% 26 Other	3 N.R.
Grade level of majority of students you teach	4% 21 1-3	39% 185 4-6	25% 118 7-9	12% 54 9-10	13% 59 9-12	7% 33 11-12	2 N.R.
Grade levels included in your school	51% 245 1-6	7% 35 6-8	11% 49 7-9	5% 24 9-12	23% 112 10-12	 7 N.R.	

TABLE 4

Multnomah County I.E.D.
Classroom Teachers by Grade Level

	26% 356	23% 323	11% 151½	7% 102	33% 456
Grade Level	1-3	4-6	7-8	Jr. Hi.	Hi. Sch.
% by Grade Level after excluding grades 1 - 3		31% 4-6	15% 7-8	10% Jr. Hi.	44% Hi. Sch.

it was expected that the percentage of responses for each category on the remaining items reported in Tables 2 and 3 would not be in close agreement. Again this expectation was due to the fact that the two populations were similar only during the third year of the project. The responses to the users' questionnaire for these items were heavily weighted by teachers who used the system during the first two years when the target population was restricted.

To further check on the credibility of the data reported herein, it should be noted that record data indicated only one-third of the teachers making a request for objectives and test items ever requested a test ditto. In response to an item on the Teacher Users' Questionnaire, 33 percent of the respondents reported they had ordered a test ditto.

B. OBJECTIVES FOR THE FIRST TWO YEARS

Objective 1: To identify the specific objectives of instruction in all elementary and secondary schools curricular areas for all grade levels

This first goal of the project is not clearly defined. Given the large number of school buildings involved in a three-county area plus the Portland Public School District, one can expect a tremendous variability in the objectives for similar courses at a given grade level. An attempt to identify specific objectives of instruction in all curricular areas for all grade levels is an extremely large task. In addition, there are no criteria that exist to determine the extent to which all of the objectives have been identified. From an operational viewpoint, during the major part of its first two years, the project limited its effort to identifying specific objectives in social studies for grade levels four through six. During the later portions of the second year and during

the third year the attempt to identify specific objectives was expanded to include the curricular areas of Mathematics, Social Studies, Language Arts, and Science for grade levels four through twelve.

The project staff identified practicing teachers as the chief source for obtaining behavioral objectives. In order to collect these objectives, teachers were invited to participate in work sessions, for writing objectives and test items, during the winter and early spring of 1967-68. During the summer of 1968 the project staff conducted two teacher workshops in the construction of behavioral objectives and writing of test items. During the winter of 1968-69 the staff worked with classroom teachers through a Department of Continuing Education credit class entitled Measurement of Educational Objectives. During these classes teachers were actually involved in writing objectives and test items. The initial effort to obtain objectives and test items proved to produce needed quantities of objectives and items at far too slow a rate. By April of 1968 the work session approach had provided only a total of 500 objectives. The summer workshop session was much more productive. Unfortunately, an exact count of the number of objectives written during these sessions was not maintained. The primary source of evidence of the productivity of the Summer sessions and of the credit courses offered during the Fall and Winter of the 1968-69 year consist of a record beginning in December of 1968. This record listed the total number of items and objectives contained in the data files. By December of 1968 the number of items had jumped to 2,830 and by April 1969, the number had reached 6,447. These latter figures do not indicate the exact number of objectives that were contained in the system because each test item contained in the record file was also associated with an objective. In some cases a single objective

was associated with more than one test item. Near the end of the second year of the project it became obvious to the staff that other procedures would have to be used in order to expand the number of objectives and test items in the system. One of the primary procedures used was to request teachers to contribute sample copies of tests they used in their instructional programs. The staff used these test items as a basis to infer the objectives. An instructional objective was written by the developmental staff for each test item selected from this item pool for inclusion in the item bank. This last procedure markedly increased the rate at which objectives were identified. By September of 1969 the number of test items and associated objectives included in the data files increased to 10,191. Through December, 1969, the number of items had jumped to 24,180 and by June, 1970, the data files contained 32,163 items. Again it should be remembered that these numbers do not indicate the number of separate objectives but the number of separate test items. There is no available data to indicate the exact number of separate objectives contained in the data bank.

Overall, the identification of specific instructional objectives has been a major problem with the project. The developmental staff found it very difficult to find teachers who were trained to think about and utilize instructional objectives at the level of specificity that had been selected as desirable for the data bank. Teachers were asked to write objectives in a form that specified the audience or students for whom the objectives were most appropriate, a specific behavior, the conditions under which the behavior was to occur, and the degree or level of acceptable performance. The decision to write the objectives at that level of specificity resulted in objectives that differed very

little from the test items themselves. The two members of the project staff sharing the primary responsibility for directing the developmental effort identified the form of the objectives as a major concern. One director identified the decision to store the objectives in specific format as "...most critical since it would be difficult to change the system after several thousand items were included. They ended up being very specific and, thus, not being usable by most classroom teachers right now. The objectives are almost test items." When asked to discuss the decision to write behavioral objectives in specific form, the second director stated, "It became obvious that it would never work. Teachers don't have time to generate behavioral objectives, can't identify objectives, but given lists they may be able to select objectives and generate curriculum." He went on to state, "I bet that teachers don't pay much attention to the objectives because they are only slightly different from the test items." The problem associated with getting teachers to identify behavioral objectives was further varified through interviews with the COMBAT Advisory Board. When asked the question, "Do you think that both objectives and test items are equally important for teachers?" Three of seven Board members indicated that from a practical point of view, at the present time test items are more important. They went on to say they felt that teachers would eventually recognize the importance and utility of the objectives. When asked what they thought some of the ways that the system would manifest itself in the classroom, two of the Board members indicated that teachers would not begin to use the objectives until after they had more experience with the use of the test items.

The record and interview data described above indicate the project was able to identify a large number of instructional objectives. However, there were major problems in getting teachers to write objectives and to use the objectives in their instructional programs. As a result, the project staff were not able to adequately identify objectives for all grade levels in all four curriculum areas included in the project.

Further evidence on the attainment of goal was obtained through responses to the teacher users' questionnaire. This questionnaire contained two structured response items related to the objectives contained in the COMBAT file. The responses to these items are reported in Table 5. Examination of this table indicates that few teachers requested objectives more than once or twice. Interviews with the staff operating the Center for receiving the teacher requests indicated that in most all cases teachers requested test items at the same time that they requested objectives. Very seldom did teachers request only objectives, however, the records of this information were not maintained. Table 5 also indicates that the majority of the teacher users who responded to the request to rate the appropriateness of the objectives rated them as approximately 50 percent appropriate. Of the remaining teachers who responded to this item, none rated the appropriateness of the objectives as very high and approximately an equal number of teachers rated them as either high or low and very low. When asked to indicate their reasons for requesting objectives, nearly 60 percent of the user respondents indicated their reason was to experiment with the COMBAT system. Slightly less than 20 percent of the respondents indicated that they ordered objectives to use as a guide for ordering test items. Likewise, only 10 percent of the respondents indicated that they requested

TABLE 5

Teacher Users' Requests and
Rating of Objectives

How many times have you requested a list of objectives?	17% 7 0	57% 24 1-2	14% 6 3-4	5% 2 5-6	0% 0 7 or more	 3 N.R.
Rate the appropriateness of the objectives for your intended purpose.	8% 3 very low	10% 4 low	43% 18 50% appropriate	14% 6 high	0% 0 very high	26% 11 N.R.

	Reason	No.	%
Which of the following best matches your reason(s) for requesting objectives?	(a) To experiment with COMBAT.	24	57%
	(b) To use objectives as a guide for planning instruction.	4	10%
	(c) To search for new ideas for classroom instruction.	11	26%
	(d) To use objectives as a guide for ordering test items.	7	17%
	(e) Other	3	8%

objectives as a guide for planning instruction. Since two of the primary reasons for including objectives in the item pool were to help teachers plan instruction and to serve as a guide for ordering test items, this data indicates that teachers seldom use the objectives for this purpose. However, nearly a quarter of the teachers found the objectives useful for searching for new ideas to be used in their classroom instruction.

When teacher users were asked to make "one positive comment and one negative comment about the procedures for obtaining objectives, list of test items and test masters," many of the comments related to the quantity and quality of the items, rather than to procedures. Two elementary school teachers stated that the objective and test items were "excellent" and "well written." One teacher stated that there were "many items to choose from" and another said "Helps get other teachers testing questions (not narrowed)." Of the nine negative comments made by secondary school teachers, six centered on the lack of sufficient breadth and depth of the objectives and items stored in the item bank. Of the twenty-eight negative comments made by elementary school teachers, five teachers indicated that the objectives were "not relevant" to these instructional programs. Another five teachers commented on the lack of sufficient items. Two other teachers commented on the quality of the test items by indicating the items were "too specific." The remaining comments to this question were directed at the procedures for using the system.

Objective 2: To develop a pool of test items appropriate for assessing the attainment of the instructional objectives as identified. Because of the close association between the identification of specific objectives

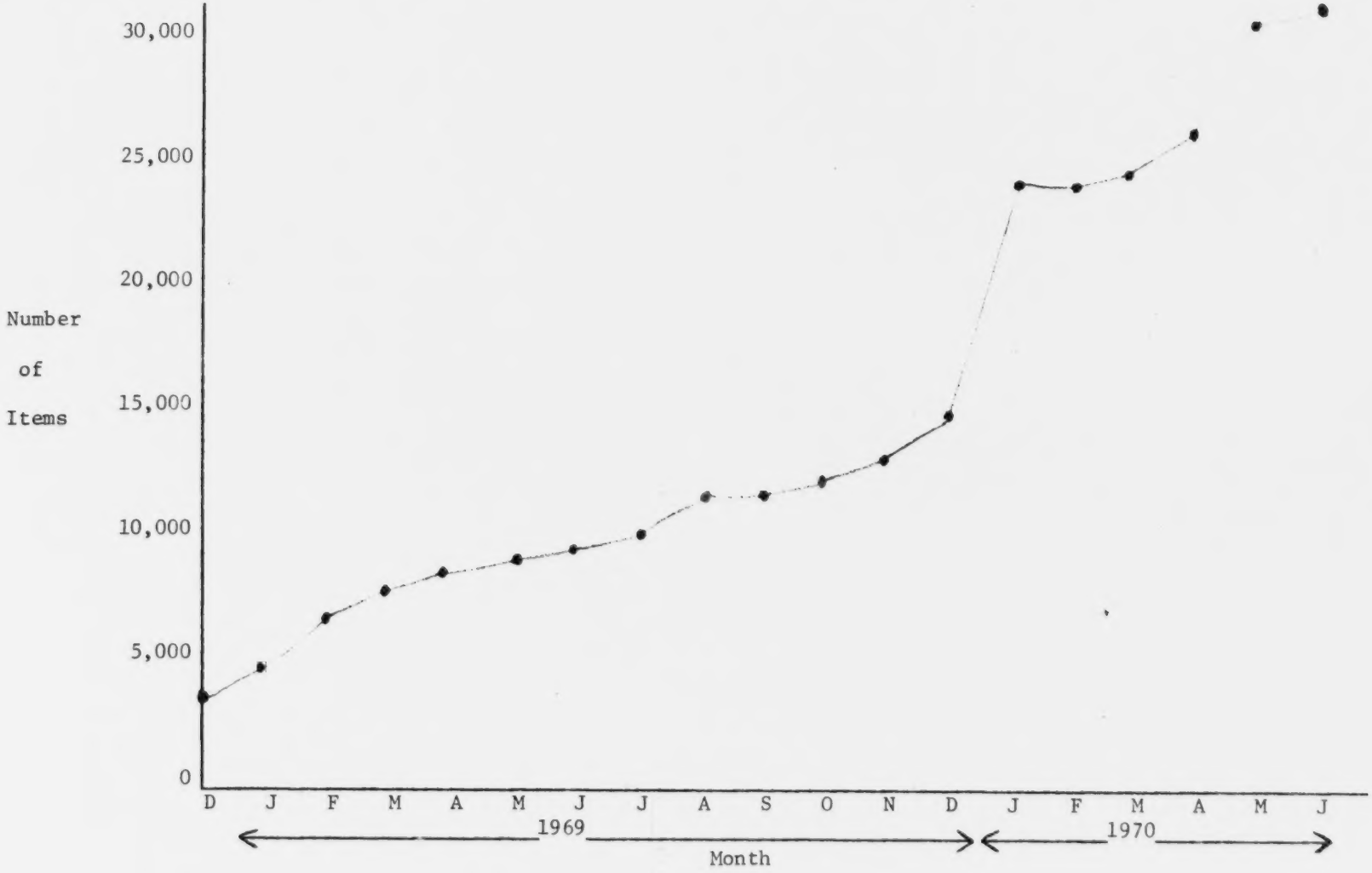


Figure 1
Cumulative Number of Items
Included in COMBAT Files
Jan. 1, 1969 to June 1, 1970

and the writing of test items much of the data reported above is appropriate for the second objective as well as the first. The record data on the number of test items and objectives is a more accurate accounting of the number of separate test items than the number of objectives. As previously mentioned, there were a total of 32,163 items contained in the COMBAT file as of June, 1970. Figure 1 illustrates the month by month rate of development of the item pool. Since this monthly tabulation was not initiated until the first of December, 1968, Figure 1 fails to illustrate the increased rate of production of test items resulting from the Summer workshops of 1968 and the classes in Measurement of Behavioral Objectives taught in the Fall and Winter 1968-69, as compared to the rate of production of test items during the Winter and Spring of 1967-68 academic year. The marked increase in the number of items stored in the COMBAT files between the months of December, 1969 and January, 1970 was due basically to the operations at the computer center. In the fall of 1969 items were being written at a rate slightly faster than they could be key punched and stored in the file. During the month of December the Computer Center hired temporary staff to catch up on the backlog of items that were written and waiting to be key punched and stored in the file.

The production of a number of test items is only one facet of the second objective of the project. The second facet relates to the appropriateness of the items for assessing the attainment of instructional objectives. The teacher users' questionnaire contained four structured response items relating to this facet of the objective. The tabulation of the responses to these items is reported in Table 6. As indicated by the first item in Table 6, slightly over a third of the teacher

respondents failed to rate the appropriateness of the test items for the associated objectives. Of those that responded, approximately half rated the items as 50 percent appropriate and eight teachers rated the appropriateness as high or very high, whereas only four rated them as low or very low. When asked to rate the test items received from the COMBAT center on item difficulty, range of content, range of item style, and clarity, most of the teacher respondents checked the rating scale. As indicated by the responses tabled to the second question in Table 6, approximately half of the teachers indicated that the item difficulty, the range of content, and range of item style were about right. Approximately a quarter of the remaining teacher respondents rated the item difficulty as hard, the range of content as similar, and the ranges of item style as similar. Approximately three quarters of the teachers rated the items as clear. Six teachers indicated that the items were ambiguous, while two rated the items as very clear. The third question in Table 6 indicates that slightly over 60 percent of the teachers felt that only zero to 20 percent of their total classroom testing could be done with test items obtained from the COMBAT system. An additional 30 percent of the teachers indicated that 20 to 60 percent of their total classroom testing could be done with test items obtained from the COMBAT system. These percentage breakdowns were approximately the same for teachers at the elementary level and secondary level. The tabulation for the fourth question in Table 6 indicates that approximately one-third of the teachers selected items from the list provided by the COMBAT center and requested a test ditto. At the other extreme, approximately a quarter of the teachers who requested test items from the COMBAT center reported that they did not use the items with students. The majority of the remaining teachers indicated that they use test items

TABLE 6

Teacher User Requests and Rating of Objectives

If you requested both objectives and associated test items, RATE the APPROPRIATENESS of the test items for the objectives.	3% 1 very low	8% 3 low	29% 12 50% appropriate	14% 6 high	5% 2 very high	3% 1 did not request both	38% 16 N.R.
Rate the test items you received on each of the following criteria:							
a) difficulty	3% 1 very hard	27% 11 hard	55% 23 about right	10% 4 easy	0% 0 very easy	8% 3 N.R.	
b) range of content	5% 2 very similar	29% 12 similar	38% 16 about right	12% 5 diverse	8% 3 very diverse	10% 4 N.R.	
c) range of item style	5% 2 very similar	27% 11 similar	50% 21 about right	10% 4 diverse	3% 1 very diverse	8% 3 N.R.	
d) clarity	0% 0 very ambiquous	14% 6 ambi-guous	74% 31 clear	5% 2 very clear	8% 3 N.R.		
Approximately what percent of your total classroom testing could be done with test items obtained from the COMBAT system?	62% 26 0-20%	10% 4 21-40%	19% 8 41-60%	5% 2 61-80%	0% 0 81-100%	5% 2 N.R.	

What did you do with the list of test items received from the COMBAT center?

	No.	%
a) Did not use with students.	11	27%
b) Selected a few items and added a few of your own before preparing a test ditto.	4	10%
c) Selected several items and added several of your own before preparing a test ditto.	5	12%
d) Selected items only from the list and prepared your own ditto.	6	14%
e) Selected items only from the list and ordered a test ditto.	14	33%
f) No Response	2	5%

from the COMBAT center and either prepared their own ditto directly from this list or added some items of their own and prepared their own test ditto. Overall this means that approximately 70 percent of the teachers who requested test items from the COMBAT system found them to be useful in their testing programs. Since the item pool was in a continuous state of development through the total project, this result is a strong indication that the project was becoming functional for the teacher users.

Overall, the data indicate that the developmental staff were able to collect a large number of items for the item file. Thirty-two thousand items represents a great deal of production. However, there is clear evidence that this item pool is far too small to make the project maximumly functional in four curriculum areas grades four through twelve. The procedures used to produce items was sufficient to obtain items that tended to be rated approximately 50 percent appropriate by the teachers. Two problems probably prevented teachers from rating the appropriateness of the items as high or very high. The first is the wide diversity of instructional approaches used by different teachers at the same grade level and in the same content. The second dealt with the mechanics of selecting items from the item pool. This second problem will be discussed in more detail under the third objective.

Objective 3: To design and operate a computer center necessary for the implementation of the test development activities. This objective has two basic components. The first concerns the development of a computer system to handle storage and retrieval of instructional objectives and test items. Included in the evaluation of this component is an examination of the interaction between the computer staff and the developmental staff, as well as an investigation of the computer time required to produce

the list of test items and tests requested by the teachers. A second component concerns the adequacy of the telephone-mail communication system between teachers and the computer center, and a determination of the teacher ratings of the print-out format for objectives and test items.

The primary source for information on the development of the computer system was a set of interviews with the staff at the computer center and the developmental staff. Unfortunately, there was no systematic documentation of the procedures and problems encountered during the developmental activities to serve as a basis for evaluative information. All but one of the school district testing representatives to the MATPB and all but one of the members of the COMBAT Advisory Board declined to comment on the operation of the computer system on the basis of a lack of knowledge of computer problems and operation.

The Portland Public Schools' Computer Center subcontracted with the Multnomah County Intermediate Education District to construct and operate the computer system. The Computer Center built the COMBAT system to complement existing computer systems that serviced a number of other projects in the Portland School District. This decision allowed the Computer Center to take advantage of a good deal of development work that had been done in relation to other projects. The original system was written in machine-level assembly language coding for the Honeywell 200 Series Computer. Instructional objectives and test items were stored on tapes in natural language format. A classification scheme was built so that each test item or objective could be coded by grade level and by a selected set of key words. This permitted the items to be retrieved by grade level and on the basis of key words. In addition, the natural language storage permitted the development of the capacity for retrieving

an objective or test item by searching the items for specific words. Therefore, when a teacher makes a request for items on a specific content that was not included in the set of key words it is possible to search each item stored in the file for specific words that were not included in the master list.

The Computer Center staff reported the chief advantage of the system as its ability to store and retrieve items before the development of a comprehensive code. Other advantages of the system were its flexibility in storage and editing capacities. The system permitted a wide assortment of printout formats available for use on computer printouts sent to teachers. However, the center staff reported they actually used only a small number of variations in the printout format. In practice the number of formats was limited to two or three. Another unique feature of the system is its capability to identify auxiliary materials such as maps and charts that were to be used with specific items. These maps and charts were coded and could be retrieved very easily for distribution to teachers along with the computer print-out material.

Limitations of the system, reported by the computer staff, are first, the system is not easily transferable to other machines. Although such a transfer is not impossible, it would require a significant amount of work. The use of the natural language storage was less efficient than the alternative of storage in a coded form. That is, it takes a greater amount of time to retrieve the items stored in the natural language than if the items were stored in a coded form. Although the system could very easily handle constructed response items and objective test items such as multiple choice and true-false, there were some problems with storage of matching items and limitations on the type of items that could be stored in the

system. A particular problem existed with storage of items relating to mathematics and technical fields such as chemistry and physics where special symbols with superscripts and subscripts were used. This problem existed because the printer did not have all of the characters needed to print mathematical or equation-type questions. In addition, only one size of character was available. Therefore, some equation test items were difficult to store and retrieve in the form desired by the teachers. Although one advantage of the system was its capacity to search individual items stored in the file for a specific word, this capability also produced some problems. Examples of problems that resulted from the search of individual items are as follows; occasionally the words being searched were contained in the distractor portions of multiple choice items and misspellings or nonstandard word usage prevented some items from being retrieved. As a result of these problems, items that were inappropriate for a particular request were sometimes retrieved. A second type of problem which exists is the lack of teacher specificity in topic or content for which they wished items retrieved. Teachers were allowed to select the maximum number of items they were to be sent. If the system identified 200 items and the teacher requested 50 items to be sent for examination, the computer would randomly select from the 200 items identified. The random selection of 50 items were printed and mailed to the teachers. This procedure sometimes prevented teachers from getting as wide an assortment of items as they may have wanted and, because of the reasons stated above, occasionally selected items that were inappropriate for the request.

The system retrieval operations were set up so a teacher could make a request by phoning into the Computer Center and stating the grade level and the topic for which she desired instructional objectives or test items.

Although an advantage of this procedure was the ease with which the teachers could obtain sample items or objectives, it presented some problems. One of the major problems existed in the lack of specificity with which teachers were able to describe their request. The operation of this system was facilitated greatly by the telephone request receivers in the Computer Center. These persons had a thorough knowledge of the system and were able to help teachers specify their content in the manner that was most compatible with the items stored in the system. A limitation of this procedure is that it requires a highly competent person to receive the request. This person must know the system and its contents as well as have the ability to interact with teachers in a way that assists the teachers in specifying the exact nature of the material for which they were testing.

During operation of the project an alternative request procedure was tried. This procedure required teachers to mail a card that contained a description of the content for which they wanted test items. The mailing procedure proved to present many problems, with the central problem being the lack of specificity in teachers' requests. For example, a teacher might put on a card simply that they wanted test items in the area of biology. Such a request was much too general and would generate a tremendous number of items. Frequently only a small number of these items actually matched the teacher's need for test items at that time. Frequently the teachers who were making requests by mail had to be contacted by the phone in order to delimit the nature of the request.

The Computer Center was only one of several key educational organizations involved in the project. The primary responsibility for maintaining

communication and other interactions between the different educational organizations was with the developmental staff; that is, the staff at Teaching Research. The task of interfacing the activities of the developmental staff and the computer staff centered on adequate communication between the two agencies. Although the staff in both agencies indicated there were no major problems in communication, they did identify a few smaller problems. First, there was no direct contact between the Computer Center and the Metropolitan Area Testing Program Board. None of the members of the Computer Center staff indicated that they knew of the operation or intents of the MATPB program. There were a few problems in obtaining feedback information from classroom teachers on the content and quality of the items stored in the item file. Although procedures for obtaining feedback from the teachers were set up by the developmental staff, few teachers took the opportunity to provide information via this route. In addition, only a small percent of teachers contacted the Computer Center after their first request. Part of the procedure of the second contact was to identify inappropriate items and to identify errors such as misspelling and incorrect or improper wording and structure of test items. Although these procedures did provide some feedback for the refinement of the items stored in the system, this feedback was smaller than that desired by the Computer Center staff.

Because the item files were stored in the natural language form, a large amount of computer time was required in order to produce an individual list of test objectives or test items for a teacher request. The actual amount of time required to produce a single list of objectives or items varied with the number of requests. Depending upon the complexity of the request, a single request could take anywhere from 20 to 30 minutes

of computer time. At the same time it should be noted that the system was built so that requests could be processed in batches. The amount of time per request was markedly reduced when the requests were batch-processed. Two similar requests could be batch-processed in less than twice the time of a single request. This means that two or three requests did not take two or three times as much computer time as a single request. For example, the records at the Computer Center indicated that where a single test may require from 20 to 30 minutes of computer processing time seven tests on one occasion were processed in 1 hour and 45 minutes. On separate occasions four tests were processed in 2 hours and 20 minutes, eleven tests in 3 hours and 51 minutes, and seven tests in 1 hour and 45 minutes. This means that the cost of producing a single test varied depending upon the nature of the request and the number of requests processed at a single time. On the basis of $100 per computer processing hour, this means that if seven tests were processed in 1 hour and 45 minutes the average cost per test was $25, when four tests were processed in 2 hours and 20 minutes the average cost per test was $58, and when 11 tests were processed in three hours and 51 minutes the average cost per test was $35. Although all members of the computer staff considered these costs per test to be extremely high, they noted that the cost per test could be reduced markedly if the number of requests from teachers was greatly increased.

Table 7 describes the amount of computer time and the associated cost involved in producing computer printouts for teachers. These data were collected from the records of a 12-week period in the spring of 1970.

Another aspect of the operation of the system at the Computer Center concerns the turn-around time between initial teacher request and delivery

Table 7

Summary of Time/Cost For Initial Requests and Test Print-outs

	Initial Requests				Ditto Masters			
Week	Number of Requests	Total Computer Time (min)	Aver. Time Per Request	Aver. Cost Per Request*	Number of Requests	Total Computer Time (min)	Aver. Time Per Request	Aver. Cost Per Request
1	3	55	18	$30	--	--	--	--
2	4	120	30	50	4	125	31	$51
3	28	231	8	13	3	49	16	27
4	7	104	15	25	5	75	15	25
5	15	172	11	18	1	20	20	33
6	5	96	19	32	4	52	13	22
7	58	280	5	8	1	15	13	25
8	8	67	8	13	--	--	--	--
9	26	200	8	13	3	50	17	28
10	--	--	--	--	4	55	14	23
11	13	100	8	13	--	--	--	--
12	3	52	17	28	--	--	--	--

* This cost is based on a rate of $100 per 60 minutes of computer time. It does not include salaries of personnel to operate the Center.

of the material to the teachers. Because batch-processing was much less expensive than processing individual test requests as they were received, the requests were usually processed at the end of each day. This meant that within 24 hours from the time a request was received the printout from the computer was placed in the mails for delivery to the teacher. On occasion a slow-up or a delay in the mail delivery system prevented the teachers from receiving the computer printouts within a time span of two days from their initial request. One additional factor contributed to the delay of delivery of the requested materials to the teachers. At the end of each month the computer system was completely devoted to the school district payroll department. During those days COMBAT requests could not be processed. This meant that on occasion there was a delay of from five to six days from the initial teacher request to the day she actually received the computer printout material. This end of the month delay in turn-around time is a result of priorities set at the operation level for the total Computer Center. It is not an inherent weakness in the design of the system itself. Rather, it represents a practical problem in the operation of a computer system that must interface with a number of other systems at a computer center.

From this limited examination of the computer system for the COMBAT project, it can be seen that a major problem with the utility of the system is associated with the extremely high cost for producing a list of items requested by a teacher. Although the system could operate on a much less expensive set of computer hardware, the existing system should be examined much more carefully for alternative procedures for reducing the cost of processing a request.

The teacher users' questionnaire contained two structured response

items and one open-ended item relating to the teachers' acceptance or reaction to the material contained on the computer printouts. When asked, "What changes in the print-out format for objectives and test items could you suggest that would make it (the print-out) more acceptable?" Only 15 of the 42 respondents commented. Four teachers indicated that test items were too scattered on the dittos. One teacher wanted space left for answers for essay questions. One teacher wanted objectives and test items grouped by subject on the first request and another suggested omitting code numbers. The majority of the remaining comments were related to the content of the items. Three elementary school teachers thought the wording of the tests was at too high a level. Although these comments constituted a very weak data base, the most frequent volunteered comments related to the space used on the test dittos. During interviews with the developmental staff, two staff members reported teachers had commented that the test questions took up too much space on the dittos and that some school principals did not want teachers to use the computer produced dittos because they used up too much paper.

Teacher responses to the two structured to response questions relating to the format of the print-outs are included in Table 8. When asked to rate the test dittos for "economical use of space on page" only 24 of the 42 respondents made a rating. Twelve of the 24 rated the dittos as high or very high and seven rated the dittos as low or very low. These teacher ratings are not totally consistent with the implication that the test dittos waste space on the page. However, it should be noted that teachers tended to rate that scale lower than any of the other scales reported in Table 8. These scales dealt with the ease of reading the ditto, whether the dittos made an adequate number of copies, whether the

Table 8

Teacher Rating of Final Test Print-outs

Rate the test dittos you received on the following criteria:	very high	high	moderate	low	very low	N.R.
ease of reading	12% (7)	24% (10)	12% (5)	3% (1)	0% (0)	46% (19)
economical use of space on page	12% (5)	17% (7)	12% (5)	10% (4)	8% (3)	43% (18)
dittos make adequate number of copies	10% (4)	29% (12)	12% (5)	0% (0)	0% (0)	50% (21)
dittos are compatible with machine at my school	17% (7)	31% (13)	8% (3)	0% (0)	0% (0)	46% (19)

Rate the form or appearance of the final test on the following criteria:	very high	high	moderate	low	very low	N.R.
readable	14% (6)	27% (11)	24% (10)	0% (0)	0% (0)	36% (15)
language understandable	8% (3)	5% (2)	27% (11)	3% (1)	0% (0)	38% (16)
form of question that you approve of using	5% (2)	33% (14)	19% (8)	8% (3)	0% (0)	36% (15)
ease of scoring test	12% (5)	29% (12)	17% (7)	3% (1)	3% (1)	38% (16)
clarity of symbols used	5% (2)	24% (10)	27% (11)	3% (1)	0% (0)	43% (18)

dittos were compatible with the copy machines at the various schools, readability, item language used, the form of a question, ease of scoring, and clarity of symbols. Although the data contained in Table 8 is limited to teacher ratings of the test dittos, there is an indication that teachers reacted favorably toward the printouts they received from the Computer Center. The high percentages of nonrespondents to these items was due to the fact that the majority of teachers who made requests from the Computer Center never made a second request for a test ditto.

A number of items were included on the general teacher questionnaire and the teacher users' questionniare to assess the teacher's perception of the adequacy of the telephone-mail communication system between the participating teachers and the Computer Center. The general teacher questionnaire asked, "Where is the nearest phone, at school, that you can use to call the COMBAT center?" Of the 472 respondents, 44 percent indicated that the nearest phone was in the school secretary's office, 28 percent indicated the teachers' lounge, a total of 17 percent indicated either in their office or the departmental office, 7 percent indicated the principal's office, only 1 percent indicated a public pay phone, and the remaining 3 percent either failed to respond or specified another location. When asked, "How easily available is this phone?", 32 percent of the same teachers indicated that it was easily available, 36 percent indicated it was fairly convenient, 15 percent indicated it was moderately inconvenient, 14 percent indicated it was inconvenient, only 1 percent indicated that the phone was unavailable, and the remaining 3 percent failed to respond. Although these responses show that some teachers may have a problem in obtaining access to the telephone before calling the COMBAT center, the majority of teachers have access to a phone either in

the teachers' lounge or in the secretary's office that is easily available or at least fairly convenient.

Interviews with the COMBAT staff suggested that no formal procedure was used to determine the number of days that should elapse between the time the teacher makes a request and receives the computer print-out materials. Although the developmental staff did survey the teacher users' at one time during the project to determine how many days were elapsing between the time they requested and received a computer print-out, it was felt this question should be explored in more detail. The survey by the computer staff found that most teachers received their print-outs within two to three days from their initial request and that most of the teacher users' seemed satisfied with this length of service. Teachers who responded to the general questionnaire and teacher users' questionnaire were asked, "In order to make the testing service most effective, what would be the ideal and maximum number of school days between the day you order a list of test items and the day you receive the list?" Table 9 contains the tabulation of the teacher responses to both of the items on the teacher users' questionnaire and the general questionnaire. By examining the table it can be seen that the majority of teachers in both samples selected the ideal numbers of days as either one, two or three. Approximately 20 percent of both of the samples chose "one day" as the ideal number of days, while approximately 30 percent of both samples indicated three days as the ideal number of days. Twenty-eight percent of the teachers responding to the general questionnaire and 36 percent of the teachers responding to the users' questionnaire identified the ideal number of days as two. This information verifies that the developmental staff and the computer staff were accurate in their initial estimates of

the number of days that should elapse between the time a teacher makes a request and the time the computer print-out were in the teachers' hands. The data in Table 9 also indicate there was very close agreement between the two samples of teachers in their response to the maximum numbers of days that should elapse between the requesting and receiving of a computer print-out. Nearly half of the teachers in both samples indicated that it should not exceed four to five days. Slightly less than 20 percent of the teachers felt that six or seven days could elapse and another approximately 20 percent felt that it should not exceed two to three days. Teacher users' were also asked whether or not the COMBAT center always sent back the test items they selected for a final test and how long it took in elapsed school days for them to receive the list of test items. The responses to these questions are shown in Table 10. Although several did not respond, probably because they did not request a test ditto, only four out of the 27 who did respond indicated the Center did not return the test items they had selected. This indicates that there were some problems in returning the proper items to teachers, but that in the vast majority of cases the Compute Center was successful in getting the right items to the teacher. The majority of teachers received the print-outs from the Computer Center within three to four days. Only six of the 34 teachers responding to this item said it took five or more days to receive the print-outs from the Computer Center. Although the Center was not always successful in holding to the intended turn-around time of two days, the turn-around time exceeded four days in less than 15 percent of the requests.

The teacher users were also asked to make one positive and one negative comment about procedures for obtaining objectives, lists of test items, and test masters. Twenty-eight teachers made a positive comment.

Table 9

Desired Elapsed Time Between Initial Request and Receipt of Test

Question: In order to make a testing service most effective, what would be the ideal and maximum number of school days between the day you order a list of test items and the day you receive the list?

General Questionnaire:

ideal number of days	2%	17%	28%	28%	16%	10%
	12	77	129	132	76	46
	0	1	2	3	4	N.R.
maximum number of days	4%	18%	44%	16%	7%	9%
	18	85	211	77	36	45
	0-1	2-3	4-5	6-7	8 or more	N.R.

Users' Questionnaire:

ideal number of days	0%	22%	36%	29%	3%	12%
	0	9	15	12	1	5
	0	1	2	3	4	N.R.
maximum number of days	0%	17%	48%	19%	5%	12%
	0	7	20	8	2	5
	0-1	2-3	4-5	6-7	8 or more	N.R.

Table 10

Item/Test Selection and Receipt

Did the COMBAT center always send back the test items you selected for the final test?	55%	10%	33%		
	23	4	14		
	yes	no	N.R.		
How long did it take (in elapsed school days) for you to receive the list	24%	46%	10%	5%	17%
	10	19	4	2	7
	1-2	3-4	5-6	6-7	N.R.

Seven teachers said the service was fast, four indicated that the people at the COMBAT center were extremely cooperative, and two others indicated that it was easy to phone in. The remaining 15 comments did not relate to procedures for obtaining the items. Twenty-eight teachers made negative comments. Only six of the negative comments pertained to the procedures for obtaining the items. Two teachers said it took too much time, two said they did not plan for tests far enough in advance, and one teacher said that the use required very careful wording and another said that the phone-in hours should be other than school time. The other comments related to item content or to depth and breadth of items. In general it can be stated that the teachers were moderately to generally favorable in their reactions to the telephone-mail communications system and to the format of the print-outs they received from the Computer Center.

The major hindrance in the present system rests with the time it takes to generate the list of items for teachers and with the requirement that the present system utilize the total computer capability as it processes the teacher requests. This latter requirement of the present system has resulted in the inability for the Computer Center to process requests very quickly when it had a heavy load of other activities such as the payroll department work. It should be further noted that the Computer Center personnel indicated that batch processing is more efficient but that the batch processing can best handle approximately ten requests per batch. Based on information provided by the Computer Center, a batch processing of ten requests would require approximately two hours of computer running time depending upon the complexity of the request. This means the maximum number of requests that could be processed by the computer per day would peak out at approximately 120. In order to reach that maximum number, the

present system would utilize the computer for a full twenty-four hour period. It can be easily determined on this basis that as the computer file grows to three or four times its present size, the maximum number of requests that could be processed per day would be somewhat reduced. At the same time, as the capacity of the file increases it can be anticipated that the number of requests per day would increase. It therefore becomes apparent that in order to make the present COMBAT computer-based testing program maximumly efficient, an alternative procedure for retrieving the items from the files should be explored.

Objective 4: To conduct the necessary teacher in-service training required to insure optimum utilization of the test development center. The developmental staff of the COMBAT project conducted several activities that were designed to serve as teacher in-service programs. Among these activities were the initial COMBAT test tryouts in the fall of 1968 with 34 teachers from the fourth through the sixth grades, Department of Continuing Education classes in Measurement of Educational Objectives during the Fall and Winter of 1968, individual school building or district level orientation sessions, and orientation dinners for a group of teacher advisory teams. The initial teacher workshops during the Summer of 1968 could also be included in this category of activity.

The record of teacher users maintained by the Computer Center indicated that by late spring, 1970, 470 teachers had requested lists of test items from the COMBAT center. These teachers had made a total of 1,144 requests of which 922 were initial requests and 222 second requests. As defined earlier, a first request was an initial contact by a teacher with the Computer Center for a list of test items or objectives, while a second request was classified as a second contact by

the teacher relating to an earlier first request. On the second request the teachers usually ask for a test ditto to be prepared. Table 11 contains a two-way classification of the number of teachers who made first and second requests. As seen in the table, 215 teachers made one first request and no second request, 49 teachers made two first requests but no second request, 62 teachers made one first request and one second request, 22 teachers made two first requests and two second requests. As can be seen by the marginal totals, approximately 70 percent of the teachers making requests never made a second request. This data confirms the comments made by the project staff that teachers made light use of the system.

The record of teachers using the system was cross-referenced with the names of the teachers who participated in each of the training activities. Of the 15 teachers who participated in the initial Summer Workshop for writing objectives in 1968, only one of these teachers was recorded as having made a request from the COMBAT center. This teacher made 14 first requests and 3 second requests. Of the 34 teachers who participated in the initial COMBAT tryouts in the Fall of 1968, only 19 were reported as having made requests to the Computer Center. Of these 19, six made a single first request and four made two first requests. Eight of the nine remaining teachers made from four through seven requests and one was recorded as having made a total of 29 first requests. All but three of these 19 teachers made at least one second request; eight made a single second request and the remaining eight made from two through six second requests. One hundred twenty teachers were recorded as having participated in the DCE classes. Fifty-four of these teachers had no record of making a request at the Computer Center. However, 24 of these

Table 11

Tabulation of Teacher Requests

Number of Second Requests	Number of First Requests: 1	2	3	4	5	6	7	8	9	10	11 or more	Total
0	215	49	21	16	7	5	2	1	1		1	318
1	62	22	13	4	1	1				1	2	109
2		14	1	3		1						19
3			2		2	1	1				1	7
4				1	2		1	1				5
5						1	1		1			3
6						2						2
7								1				1
8								1				1
9												0
10												0
11 or more												0
Total	277	85	37	24	12	11	5	4	2	1	4	

54 individuals were recorded as having attended the same class. Of the 56 teachers from the DCE classes who were recorded as making at least one request, 34 made a single first request and no second request. Sixteen of these teachers made a single second request and one made seven second requests. One teacher was recorded as having made 8 first requests and 7 second requests. Seventeen teachers made from two through five first requests with the majority of these making a single second request.

The teacher advisory-team dinner meetings were designed to include a number of administrative staff and counselors from the school districts serviced by the COMBAT system. Of the 174 individuals invited to participate in the dinner orientations, 79 were in nonteaching positions. Eight of these 79 nonteaching professional personnel made at least one request to the COMBAT center. Of the 95 teaching personnel attending these sessions, 72 were not recorded as having made a request of the COMBAT system. Of the 23 teachers that made a request, 16 made a single request. Of the total 174 personnel attending these sessions, 15 made more than one request. Of these, two made one first and one second request, three made two first requests and no second request, two made two first and two second requests, four made four first and no second request, one made four first requests and one second request, three made five to seven first requests without a second request, and one was recorded as having made 14 first requests and three second requests. There are no records that allow the determination of the number of requests made by the personnel who attended the school district or building orientations sessions conducted by the COMBAT staff.

On the whole, the record data indicate that in-service programs designed to encourage teachers to use the system were not successful in

producing a large number of teacher users' of the COMBAT system. This judgment is based on the evidence that a large number of teachers who participated in the program did not use the system or used it only to a very limited extent. Items were contained on the interview guides and questionnaires to take a closer look at the objective.

The members of the Advisory Board were asked the question, "Do you think that the procedures used to insert the COMBAT system into the on-going programs of the participating schools (such as: workshops, in-service programs, and teacher orientation meetings) were the best possible?" All of the Board members responded "yes," with some qualifications. They all felt that the problem of orientation and getting teachers to use the system existed throughout the project, but that all of the staff members worked very hard to solve this problem. Each of the members of the Board indicated the Advisory Board had been consistently involved throughout the project in attempting to identify procedures to improve the teacher utilization rate. When the Board members were asked, "What other strategies might have been employed to insert the COMBAT system into the schools?" a variety of reactions were obtained. Three members of the Board indicated they felt the project should have worked more closely with the curriculum directors in the school districts rather than with the testing representatives. Three of the members of the Board stressed that they felt the project should have been more fully developed before an attempt was made to encourage the teachers to use the system. One member of the Board indicated the school principals should have been more involved in the project operations and at least one teacher from each of the schools should have been actively involved in the project development. He suggested these procedures would have helped to encourage

the individual teachers in the buildings and the school districts to use the system to a greater extent. One member of the Board said the stress should have been placed on the development of individualized instruction rather than on an addition to the testing program.

The questionnaire mailed to the district representatives to the MATPB organization contained two items related to the in-service program. The first item asked testing representatives to rate the effectiveness of each of the in-service programs. Of the 14 responses obtained, the majority tended to rate the effectiveness of the in-service programs as average. However, the ratings differed somewhat for each of the activities. The testing representatives were asked to rate each in-service program as to the degree of effectiveness on the basis of a five-point scale: very low, low, average, high, very high. For the Summer Workshop, 1968, five rated the program as average in effectiveness, four rated it as high, two rated it low or very low, and three failed to respond. The Fall, 1968, initial experimental trials in social studies for grades four through six were rated average by six representatives, high by one, low by one, and six representatives failed to respond. Teacher classes on Measuring Educational Objectives tended to be rated highest by the district representatives. Six rated these as being highly effective, three rated it as average, two rated it as low, and three failed to respond. Seven of the fourteen rated the teacher advisory dinners as average in effectiveness, two rated them very high, one rated high, two rated them low, and two failed to respond. The district and building level teacher orientation sessions were rated average by five representatives, three rated high, two rated low, and two rated very low, and two failed to respond. The representatives were asked to respond to the question,

"What other strategies might have been employed to increase the use of the COMBAT system in participating schools?" Nine of the fourteen representatives responded to this open-ended item. Four of the responses suggested these people felt the project should have used school district personnel, with whom teachers were more familiar, as the basic source of information about COMBAT. These personnel would include curriculum directors and district testing personnel. Two of the comments indicated the representatives felt that the project should have been developed to a full extent before it was made available to teachers. The other three comments were as follows: "Make available, or circulate, a very accurate and uninflated listing or print-out of subject areas in which objectives and items are available", "Some methods whereby teachers will more readily try the program", "Send teams to school buildings to sell COMBAT."

Both the teacher Users' Questionnaire and the teachers' General Questionnaire contained an item designed to determine what proportion of the teacher users and the general teacher population participated in each of the in-service activities. Table 12 contains a tabulation of the responses. As can be seen in the table, the Fall and Winter D.C.E. classes and the building or district level orientation meetings effected the greatest proportion of teacher users. Only a very small number of the teacher users reported involvement in any of the other in-service activities. The general teacher questionnaire indicated that the building or district level orientation meetings were able to reach approximately 9 percent of the teachers. The other activities affected only very small percentages of the total teacher population.

When the teacher users were asked, "How do you rate your familiarity with the COMBAT system?" approximately 30 percent responded "near zero

Table 10

Attendance of In-Service Programs

Teacher Users': Check each of the following activities in which you participated.

	No.	%
Summer 1968 Workshop	1	3%
Fall 1968 Initial Trials	2	5%
Fall & Winter 68-69 D.C.E. Workshops	10	24%
Building or District Level Orientation Meetings	12	29%
COMBAT Advisory Team Dinner, 1969	3	8%

General Questionnaire: Check each of the following activities in which you participated.

	No.	%
Summer 1968 Workshop	6	1%
Fall 1968 Initial Trials	20	4%
Fall & Winter 68-69 D.C.E. Workshops	14	3%
Building or District Level Orientation Meetings	43	9%
COMBAT Advisory Team Dinner, 1969	10	2%

or low," 30 percent responded "barely enough to use it," and approximately 36 percent responded "moderate," while only 3 percent responded "high." Part of this fairly low rating of their familiarity with the system may be due to the low rate of use by the teachers and/or a time lag from the last time they used the system to the date of the questionnaire. Slightly over 50 percent of these teachers indicated they have not used the system since the 1968-69 school year. Twenty-four percent indicated they had not used the system since the end of December 1969, while 14 percent of the teacher users indicated they hadn't used the system since January, 1970. Eight percent of the teacher users did not indicate when they had last used the system.

The general teachers' questionnaire contained two items that attempted to determine the approximate proportion of teachers in the target population that have used the COMBAT system. When asked if they had ever used the COMBAT system, 13 percent of the respondents indicated "yes", 85 percent indicated "no", with 2 percent not responding. Eleven percent of the total respondents indicated they had used the system once or twice, while the remaining two percent reported they had used the system more than twice. When these same teachers were asked whether or not they had ever used the test items from the COMBAT system, 11 percent responded "yes", 86 percent "no", with 3 percent not responding. Nearly 70 percent of those that reported they had used the system also signified they used the items once or twice, while the remaining teachers indicated that they had used the items more than twice.

In addition to the in-service activities conducted by the developmental staff, several procedures were used to distribute information about the COMBAT system. These methods included the distribution of

brochures to individual school buildings through the cooperation of the County I.E.D. agencies, the distribution of telephone stickers advertising COMBAT, the production and distribution of a slide-tape presentation, distribution of matchbooks advertising COMBAT, the distribution of COMBAT puzzles, a presentation about COMBAT at the 1969 Oregon Education Association State Convention, and an article about COMBAT in the December, 1970, issue of Oregon Education--a publication of the Oregon Education Association. Based on the responses to the teacher questionnaire, the COMBAT brochure was by far the most effective of these procedures. Fifty-two percent of the teacher users reported that they had seen a copy of the brochure, while 35 percent of the general teacher population indicated they had seen a copy of the brochure. Twenty-seven percent of the teacher users and 15 percent of the respondents to the general questionnaire said they had seen the article in Oregon Education. Seventeen percent of the teacher users and 7 percent of the respondents to the general questionnaire had seen the telephone stickers, while 14 percent of the teacher users and 9 percent of the respondents to the general questionnaire had seen the slide-tape presentation. The remaining activities reached only small percentages of the teachers. Nineteen percent of the teacher users and 48 percent of the general teacher population had seen none of the documents or presentations listed above.

The testing representatives from the districts were asked to rate the effectiveness of each of these methods of dissemination of information. The dissemination tactic that received the highest rating by the representatives was the COMBAT slide-tape presentation. Five of the respondents rated this as high, four rated it as average, two rated it low or very low, with three not responding. Distribution of brochures was rated as

high by two members of this group, while seven rated it average and three rated it low, with two not responding. The telephone stickers were rated as average by six representatives, four rated it low, and four failed to respond. The journal article was rated as very high by one representative, high by a second, average by seven, low by two, with three not responding. Distribution of the matchbooks was rated as average by four representatives, low by four, very low by two, with four not responding. The distribution of COMBAT puzzles was rated as average by four, low by four, very low by one, with five not responding. The COMBAT presentation at the State Education Association Convention was rated high by one representative, average by three, low by five, and very low by three, with two not responding.

The general teacher questionnaire also asked the question, "If you intended at this moment to call the COMBAT system for any reasons, how easily could you locate the telephone number?" Thirty-one percent of the respondents indicated they hadn't the "slightest idea who might have the number," while 50 percent reported they know who should have it or who might have it. Four percent of the respondents indicated they "thought they knew where they wrote it down," while 14 percent indicated they knew "exactly where to locate the number."

Although the developmental staff conducted a wide range of activities aimed at distributing information about the COMBAT system and encouraging teachers to use the system, the data indicate they were only moderately successful in this effort. There is also an indication in the data that dissemination by personnel outside of the individual school districts lack efficiency. Wide-spread distribution of information relevant to the system is probably highly dependent upon the cooperation of school

district personnel that have day-to-day contact with teachers. Such procedures probably require the training of specialized school building personnel to a degree that would make them equivalent to building consultants. Such procedures would require a considerable amount of volunteered personnel time by individual districts or fairly large amounts of special funded resources to pay each of these building representatives to participate in extensive training sessions.

Objective 5: To improve the overall effectiveness of instruction in all curricular areas and grade levels presented in the elementary and secondary schools in the participating districts. There is no evidence that the project staff conducted any in-depth surveys of the testing patterns used by teachers during the early stages of the project. In an attempt to obtain some baseline data from the general teacher population and teachers who have used the COMBAT system, questions relating to teachers' testing patterns were included in both teacher questionnaires. Responses to these items are tabulated in Tables 13 and 14. The General Questionnaire asked, "How often do you test in your classroom?" As indicated by the responses tabulated in Table 13, most teachers responding to the general questionnaire stated "as it seems appropriate." Thirty percent of the teachers indicated they tested after each major unit, and 23 percent indicated they tested after each instructional unit. There was some variation on testing patterns depending upon grade level. The major differences in the trends by grade level were that a large proportion of secondary teachers indicated they tested after each major instructional unit. The reasons for testing are also listed in Table 13. As shown, a large proportion of the teachers used tests for grading and reporting student progress, to diagnose the student weaknesses and to

Table 13

Teacher Testing Patterns

How often do you test in your classroom? (Check each appropriate category.)

	No.	%
After each instructional unit.	112	23%
After each MAJOR instructional unit.	140	30%
Daily	10	2%
Weekly	82	17%
Monthly	17	3%
Quarterly	6	1%
As it seems appropriate.	329	70%
Each grading period.	25	5%

Why do you give tests?

	No.	%
To plan instruction.	179	38%
For grading and reporting student progress.	302	63%
To monitor student progress.	250	53%
To diagnose student weaknesses.	292	61%
To provide guidance for students' individual study.	185	39%
To motivate study.	185	39%

Table 13 (continued)

Approximately how often to you test for each of the following purposes?

Pretest	13% 61 Never	35% 167 1-3 times/yr	13% 59 4-6 times/yr	11% 50 1-2 times/mo	13% 61 3 or more times/mo	[illegible] [illegible] N.R.
Posttest	3% 17 Never	13% 60 1-3 times/yr	20% 96 4-6 times/yr	28% 132 1-2 times/mo	19% 93 3 or more times/mo	16% 74 N.R.
Diagnostic Test	5% 26 Never	38% 181 1-3 times/yr	17% 88 4-6 times/yr	15% 70 1-2 times/mo	7% 33 3 or more times/mo	16% 74 N.R.
To check on instructional effectiveness but not to grade students.	10% 45 Never	23% 111 1-3 times/yr	19% 92 4-6 times/yr	17% 80 1-2 times/mo	13% 61 3 or more times/mo	[illegible] 83 N.R.

Table 14

Teacher Users' Testing Patterns

Approximately how often do you test, in your own program, for each of the following purposes?						
(a) Pretest	8% 3 Never	27% 11 1-3 times/yr	19% 8 4-6 times/yr	14% 6 1-2 times/mo	5% 2 3 or more times/mo	29% 12 N.R.
(b) Posttest	0% 0 Never	10% 4 1-3 times/yr	33% 14 4-6 times/yr	19% 8 1-2 times/mo	14% 6 3 or more times/mo	24% 10 N.R.
(c) Diagnostic Test	5% 2 Never	29% 12 1-3 times/yr	14% 6 4-6 times/yr	19% 8 1-2 times/mo	8% 3 3 or more times/mo	27% 11 N.R.
(d) To check on instructional effectiveness but not to grade students.	5% 2 Never	19% 8 1-3 times/yr	22% 9 4-6 times/yr	14% 6 1-2 times/mo	8% 3 3 or more times/mo	33% 14 N.R.
How many times have you used the COMBAT test items for:						
(a) a pretest	27% 11 0	10% 4 1	8% 3 2	5% 2 3	8% 3 4 or more	46% 19 N.R.
(b) a posttest	24% 10 0	8% 3 1	12% 5 2	17% 7 3	5% 2 4 or more	55% 23 N.R.
(c) a diagnostic test	33% 14 0	17% 7 1	5% 2 2	5% 2 3	0% 0 4 or more	41% 17 N.R.
(d) a test designed for one student or a small group of students.	38% 16 0	3% 1 1	0% 0 2	3% 1 3	0% 0 4 or more	57% 24 N.R.
Approximately what % of your student grading or evaluation is based on tests composed of items like these stored in the COMBAT system?	41% 17 0-20%	24% 10 21-40%	14% 6 41-60%	5% 2 61-80%	0% 0 81-100%	17% 7 N.R.

monitor student progress. Approximately 40 percent of the teachers reported they tested to plan instruction, to provide guidance for student individual study, and to motivate study. There were also some shifts in the patterns of reasons for testing at the different grade levels. Slightly greater proportions of elementary teachers used tests for planning instruction, whereas a somewhat greater proportion of secondary teachers used the test to motivate study.

Approximately 85 percent of these teachers indicated they "mainly obtained test items from the information contained in their instructional materials, such as textbooks, films, and recordings." Of this majority, approximately 75 percent wrote their own test items, whereas one quarter used items prepared by textbook publishers. Approximately 80 percent of the teachers in the general population indicated they did not use any special references in constructing test items. The last item in Table 13 and the first item in Table 14 are responses to the same question on the two teacher questionnaires. Although the percentages differ in the two sets of responses to the question of how often teachers pretest, posttest, use diagnostic tests, or test to check on instructional effectiveness, there are few consistent trends that can be observed by examining the two tables.

It was felt that these two tables may provide some clue as to whether or not teachers who had been exposed to the COMBAT system had changed their testing patterns. However, the evidence is not in the data. Table 14 indicates that teachers used the COMBAT system for posttests much more frequently than for any other purpose. However, the first tabulation in Table 14 indicates that the same pattern existed in the teachers general use for tests. A further examination of the first two

items in Table 14 shows that teachers used COMBAT items less often for diagnostic purposes than for posttest purposes as compared to their general ratio of diagnostic tests to posttests. The last item in Table 14 shows that slightly over 40 percent of the teachers reported they could use the items contained in the COMBAT system for approximately zero to 20 percent of their student grading or evaluation practices. Approximately one fourth of the teacher users said they could use COMBAT items for 20 to 40 percent for their total testing program. Fourteen percent indicated that they could use COMBAT items for 41 to 60 percent of their testing program, whereas five percent indicated that they could use COMBAT items for 61 to 80 percent of their testing program. Seventeen percent of this group of teachers failed to respond.

In order to get a more direct measure of the impact of the COMBAT system on classroom instruction, teacher users were asked the question, "How did the COMBAT system change your classroom instruction in each of the following areas: frequency of testing, frequency of pretest, planning tests related to specific objectives, planning instruction for specific objectives, use of tests in new ways, use of objectives in new ways, time required for test construction?" Approximately 30 percent of the respondents failed to answer this question. Of those that responded, approximately 80 percent indicated there was no change in the frequency of testing. The remaining 20 percent were about equally split between "more often" and "less often." Approximately two-thirds of those responding reported the "frequency of pretest" was unchanged as were "using tests in new ways," and "using objectives in new ways." The remaining one-third indicated they "more often" used pretests, used tests in new ways, and used objectives in new ways. Approximately 60 percent of the teachers who

responded to this question indicated that they "planned instruction for specific objectives" more often or much more often, whereas 40 percent indicated no change. All but 7 of the teachers responded to the portion of the item that asked them how the COMBAT system effected the "time required for test construction." Of the 35 responding, approximately 20 percent indicated it took "more time," 20 percent indicated "no change," and 20 percent indicated "less time," while 10 percent indicated it took "much more time," another 10 percent indicated that it "took much less time." On the basis of these responses, there was some positive impact on the instructional practices of the teachers using the COMBAT system. Although this effect was not great, the trend was in the positive direction.

The questionnaire distributed to the district testing representatives asked the question, "What have you actually observed about teachers and/or classrooms that illustrates the impact of the present COMBAT system?" Ten of the 14 who returned the questionnaire said they had not observed any direct impact of the COMBAT system on the classrooms. However, some of these representatives qualified their answers by stating that teachers opinions varied as to the feasibility of the program and when properly used they could see value in the COMBAT system. Two said they had not been involved with the COMBAT project long enough to actually observe direct impact. One reported he had heard teachers state they were more aware of their own objectives and now have more direction in their teaching. Another indicated that those teachers he had talked to, who had used the system, appreciated the service. Another testing representative indicated he had found teachers who had used the system highly enthusiastic for what they obtained. One representative reported the

observation of an instance of one teacher using the system to test fourth grade students on Northwest Indians. He further commented that she reported it as a "good test and was pleased with the accompanying map materials." One representative said "teachers who had used the system and found a lack of materials were frustrated or disappointed" with the COMBAT project.

When the representatives were asked to comment on the most critical project decisions and how these decisions affected the project, the most common reply was related to the decision to expand the COMBAT system to include all grade levels in four curricular areas. In general, the representatives felt this decision encouraged teacher use of the system before it was adequately developed. The result was teacher frustration and dissatisfaction with the materials they obtained from the COMBAT service. On the positive side, one representative reported the decision to ask teachers for their objectives and items produced wider and more frequent use of the system. When asked if they agreed with the majority of the project decisions relating to its operation, 6 of the 14 representatives indicated "yes," two indicated "no," and six declined to respond. Here again, the majority of the respondents commenting on these decisions indicated they felt the project expanded much too rapidly. They indicated the rapid expansion caused the project to lose face with teachers who attempted to request items for which there were few items stored in the pool.

Members of the Advisory Board were asked, "What are some of the ways you thought the system would be manifested in the classroom?" One individual reported the system would force teachers to identify "what they were trying to accomplish." Two reported the system provides the

teachers with pretest knowledge, objectives for planning a unit based on pretest, and posttest knowledge. These representatives also mentioned the system could be used for diagnostic testing. Three representatives said they could visualize the system providing the needed curriculum for individualization both on a one-to-one basis and on a group basis. Two individuals indicated the use of the test items and then the possible addition of objectives after familiarization with the system.

When members of the Advisory Board were asked, "What manifestations of the system have you actually observed in the classrooms served by the system?" all of the Advisory Board reported only limited or no direct observations, not enough to make any definite statements about changes caused by COMBAT. When asked, "What changes should be made in the operating procedures of the system so that it might attain the potentials you described?" two of the Advisory Board reported they would stress a complete workable file in only one area where the teachers could rely on the system to run smoothly from the very beginning. Two of the Advisory Board indicated that anyone designing a similar system should have adequate financial support. Other recommendations were "start from the bottom, the teachers level, the move to the district level, etc." and "have a preconceived taxonomy where materials may be collected to fill the gaps in the specified areas and the computer system should be built to accommodate random access to improve turn-around time."

When the Advisory Board was asked, "What were the most critical project decisions as you perceive them, and how did they affect the project?" The following replies were obtained: "The decision to involve the testing people instead of curriculum people was a mistake. If curriculum people would have been involved, there would have been a more

solid base and closer contact with teachers," "The decision on what area the initial item pool would cover and the program for input and output of data. The real problem was the COMBAT project should have been designed for five years rather than three," "The point at which to make the project operational was a critical decision," "We should have stayed with the fourth, fifth and sixth grade social studies and not expanded to other areas until enough money was budgeted to supply teachers for writing objectives and items," "The two critical decisions were the expansion of the item file and the use of teachers' written test items in the item file." Overall the Advisory Board seemed to be most concerned about the project's decision to expand the item pool to all the grade levels in four curricular areas before any one area was completely developed.

All in all there is little evidence that the COMBAT project had any dramatic impact on the classroom instruction in the schools affected by the project. However, there was no baseline information from which to make comparisons and no project long range systematic effort to collect data for this objective. There is some evidence indicating that the project was making a slight increase in the number of times teachers used tests and in the way in which they used tests. However, the move in that direction was not great. Teachers who used the system reported the greatest change occurred in the frequency to which they taught to specific objectives. This evidence suggests that when the system is completely developed there is a good potential for a computer-based testing program, including files of behavioral objectives, to significantly effect classroom instruction. However, before this can occur, the item files must be more thoroughly developed than was possible in the three years of the current COMBAT project.

Objective 6: To conduct the necessary information dissemination activities which will make this system a model for similar centers to be located throughout the United States. This objective can be interpreted in at least two ways. One interpretation relates to the dissemination of information within the area affected by the project itself. The other interpretation concerns the dissemination of information to interested parties outside of the COMBAT service area. Much of the data recorded for Objective 4 relates to the first interpretation. The reader interested in this interpretation of Objective 6 is referred to the discussion presented under Objective 4.

Educators located outside of the immediate service area had three primary sources for information about the COMBAT project. These included presentations at national professional association meetings such as the annual meeting of the American Educational Research Association, the National Council on Measurement in Education, and the National Association for School Administrators. During late 1969 and early 1970, members of the project staff made formal presentations about the COMBAT system to each of these groups. Other sources of information were contacts through the Title III project office in Washington, D.C. and the distribution of newsletters by the project developmental staff. The developmental staff reported receiving a total of 33 formal requests for information about the COMBAT system from individuals outside of the service area. These requests came from individual school districts, universities, research and developmental centers, as well as from individual interested people. Fifteen of the requests came from the East Coast states, 8 from the Midwest states, 3 from West Coast states, 2 from countries outside of

the United States, and 5 from areas within the state of Oregon not serviced by the project.

During the 1968-69 academic year the developmental staff produced and distributed a COMBAT Newsletter bimonthly. As of mid-July, 1969, the COMBAT Newsletter mailing list contained slightly over 300 names. However, in the 1969-70 academic year only one version of the COMBAT Newsletter was produced and distributed. The developmental staff reported the primary reason for the slow down in production of the Newsletter was due to a shift in responsibility for publication. During the previous year the developmental staff had composed and published the Newsletter but during the past academic year, the Multnomah County Intermediate School District was responsible for its publication. There appeared to be some communication problems between the two agencies in carrying out production of this Newsletter. This problem apparently arose as a result of shared production responsibility.

Much of the distribution of information to interested people outside of the immediate service area was limited to exchange of items and objectives and to general information about the intents and activities of the COMBAT project. On the basis of information obtained by the evaluation staff, there appears to be a lack of complete documentation of the specific details of the development of the test items and development of the computer system. Part of the explanation for this was a lack of staff time to devote to this activity. Because limited resources were available to the two technical staffs of the project, the time required to completely document all of their activities was not available. Lack of sufficient funds for this type of activity is very common with projects sponsored by funding agencies. If the dissemination activities

of projects similar to COMBAT are to improve, funding agencies will need to provide the resources for personnel to completely document their activities.

C. OBJECTIVES OF THE THIRD YEAR

In addition to the objectives of the first two years, the third year of the project attempted to obtain four goals. These were: a) to increase the files by at least 20,000 objectives and items in grade levels four through twelve in the following subject areas: Mathematics, Science, Social Studies, and Language Arts, b) to introduce additional teachers to the COMBAT system and encourage regular usage by teachers at all grade levels, c) to increase the number of schools actively using the COMBAT system, from 79 of the possible 250 elementary schools in the MATPB area, to at least 150 elementary schools and at least one-half of the 59 secondary schools, d) to provide an index of objectives and items listed by content areas for the grade and subject matter areas for which materials are developed.

On June 1, 1969, the COMBAT files contained 7,703 items. By June 1, 1970, the COMBAT files contained 32,163 items. Clearly, the project attained its objective of increasing the files by 20,000 items. The project exceeded its objective by nearly 5,000 items.

The record data did not permit a determination of how many of the teachers, reported as having used the COMBAT system, were added to the list of users after June, 1969. However, the responses to an item on the teacher users' questionnaire indicated approximately 50 percent of the teacher users had used the system during the 1969-70 school year. Records of the number of requests made each month shows there was an increase in

the number of requests during the latter months of 1969. During the month of September, 1969, there were a total of 34 first and second requests. The number jumped to 170 requests during the month of October and to 138 first and second requests during the month of November. In November, 1968, there were only 28 first and second requests. In December, 1968 and 1969, the number of requests were 91 and 139 respectively. These comparisons provide some indication that the orientation sessions during October, 1969 helped to increase the number of teachers making requests of the COMBAT system.

By June of 1970, a total of 148 elementary schools and 64 secondary schools had one or more teachers request items from the COMBAT center. This means the project was successful in its objective to increase the number of elementary schools having at least one teacher using the COMBAT system from 79 to approximately 150. The project exceeded its objective of getting teachers in at least 30 secondary schools to use the system. A total of 54 secondary schools were recorded as having at least one teacher make a request of the COMBAT center. Of these 54 secondary schools, 21 recorded one teacher making a request, 13 recorded two teachers, eight recorded three teachers, eight recorded four, five, or six teachers, three recorded seven or eight teachers, and one had eleven teachers making a request of the COMBAT center. These teachers made a total of 280 first requests and 24 second requests for a total of 304 calls to the COMBAT center. In all, a total of 146 teachers in the secondary schools made requests of the COMBAT center for an average of slightly over two per teacher.

During the fall of 1969, the developmental staff prepared an index of key words in each subject area for different grade levels. Copies

of these indexes were distributed to individual teachers and school buildings with the cooperation of the Intermediate Education District offices. In response to the question, "Do you have access to the COMBAT computer-based test development index for your grade level and subject area?" Sixty-two percent of the teacher users indicated "no," 18 percent indicated "yes," and 20 percent failed to respond. This result demonstrates that the indexes were not adequately distributed to teachers in the service area and the follow-up of the distribution procedures for the indexes was not adequate. Because of the small number of teachers having access to the indexes, teachers responses to the usefulness, complexity, and comprehensiveness of the index were too small for reporting in this evaluation.

In general, the objectives of the third year were met or exceeded by the project staff. The primary exception to this general trend was the lack of adequate distribution of the index of objectives and items to teachers in the area serviced by the project. Although the indexes were prepared, they failed to reach the teachers.

D. PERCEIVED PROJECT POTENTIALS

Innovative developmental efforts have traditionally been difficult to implement in the classrooms of elementary and secondary schools. As indicated by the moderate number of teachers that used the COMBAT system, this project was no exception to the rule. However, the initial success of convincing teachers to use an innovative idea is not always an adequate measure of the potential of the innovation. For these reasons, the evaluators attempted to determine the strength and weaknesses of the COMBAT system as perceived by teachers, testing representatives, and the

Advisory Board. These same educators were asked for their opinions about the appropriate directions for future development of computer-based testing programs.

When teacher users were asked to rank six possible uses of the COMBAT system in order of usefulness, there was some confusion in the manner in which teachers responded. However, on the basis of the data that were obtained, the teacher users ranked "tested the effectiveness of specific instructional methods or materials" and "provide feedback for students on their current level of learning (achievement)" as the two most important potential uses. "Enhance the teacher's role as an instructional manager" was ranked third. To "facilitate systematic curricular revisions" and "facilitate district-wide assessment of learners and the instructional program" were ranked in fourth and fifth position. "Facilitate daily testing by classroom teachers" was ranked sixth.

In response to the question, "What do you perceive as the major strength of the COMBAT system?" the majority of the teachers responded that it saved a good deal of teacher time. The second most frequent response related to "testing for specific objectives" while the third most frequent response centered on the advantages of sharing testing ideas and objectives with other teachers. In response to the question, "What do you perceive as a major weakness of the COMBAT system?" the overwhelming majority of responses indicated that the lack of complete development of the system reduced its effectiveness for use by classroom teachers. These teachers indicated that before the system can be effective, the item pool must contain a wider variety of test questions and a large number of questions on each specific content area.

When asked "What other services would you like to see made available from the COMBAT center?" the teacher users suggested the following services: test grading and item analysis for teachers, games, lists of textbooks and audio-visual materials related to various fields, names of people and groups willing to provide special services to the schools that allow student exposure to more community "reality experience," spelling and vocabulary grade level tests, diagnostic reading tests, more ditto masters with labeled drawings to be used as student handout study aids, suggestions for planning units to meet specific objectives, and more questions on each subject area in specialized programs.

School district testing representatives were asked, "For future development of computer-based testing programs, what do you think is the greatest potential use for objectives and test items stored in this system?" In response to the question, two individuals reported "It is a pooling of vast resources, the ability to utilize and produce in various kinds of areas and knowledges, and a capacity to store and retrieve information at any particular time by any particular person." Another reported "Knowing where your students are in relation to the curriculum concepts and what they were taught." Other comments identified the greatest potential as "improving individualized instruction" and "for producing better prepared and better educated students, along with the possibility to have school building and district standardization."

When asked what additional services they would like to have available from this system, the COMBAT Advisory Board reported the following: diagnostic information on the students who have used the system, enough different grade levels and items so that students can be administered tests that are good indicators of achievement, complete item banks in

all areas with norms that check for validity and reliability, activities that indicate how objectives are to be achieved, modular units (10-15 items) that can be retrieved rapidly for measurement of selected objectives and that appear in hard cover. When asked what changes they would make in the operating procedures of the system so that it might achieve the potentials they described, the members of the Advisory Board reported the following: "stress a complete workable file in only one area where teachers can rely on the system and it will run smooothly from the very beginning," "more adequate financial support," "start working with individual teachers before moving to a district level," "have a preconceived taxonomy where materials can be collected to fill the gaps in specified areas," "build in a random access to the computer system," and "make the system better known to teachers or at least find some way to get them to use the system, and involve the curriculum people more fully in the project operations."

In order to get a general overall picture of the response of the Advisory Board to the total project, they were asked the question, "Do you think the computer-based testing service is a sound and practical concept?" All members of the Advisory Board responded with a definite "yes." The testing representatives were asked to rate the total project on the following criteria: usefulness, importance, significance, effectiveness, and feasibility. On "usefulness," eight of the representatives rated the project as high, one rated it as very high, two rated it average, two rated it low, and one failed to respond. On the "importance" criteria, eight representatives rated the project as high, one as very high, two as average, and three failed to respond. On "significance," nine representatives rated the project as high, one rated it as average,

one rated it low, and three failed to respond. On "effectiveness," one representative rated the project high, three rated it average, six rated the project as low, two rated it very low, and two failed to respond. On "feasibility," two representatives rated the project very high, seven rated it high, five rated it average, and two failed to respond. When asked to explain the basis for their rating on each of the criteria, most representatives indicated they rated the "effectiveness" of the project lower due to the lack of teacher use of the system. However, the majority of the representatives explained their high ratings on the other criterion on the basis of the potential for the concept, especially when it is more fully developed. The representatives implied that such a system is a forerunner of what is to come in education and what will be very useful as a teacher time-saving device and as a device for improvement of general instructional procedures.

The interviews with developmental and computer center staff indicated that the majority felt the COMBAT project had demonstrated the concept to be feasible, but operational and developmental procedures would have to be refined before the project could be a truly effective instrument for use by classroom teachers. When asked to rate the efficiency of the COMBAT retrieval system, three of the four members of the computer staff felt the project had good potentials for being efficient if more teachers would use the system. But in its present state, the retrieval system was less efficient than what they would like it to be. A fourth member of the computer staff indicated the system was good but it was extremely expensive and probably "not worth the money it cost to produce teacher requests." This latter comment was qualified by a "yes" response to the question, "Do you think the effort would be worth the money if more

teachers would use the program?" Interviews with the key members of the developmental staff revealed that these personnel felt the system had demonstrated itself to be feasible as a concept, but had not been successful in demonstrating the computer-based testing system to be an efficient and effective tool for classroom teachers. These staff members also suggested that before the system could be an efficient and effective classroom tool there would have to be extensive development and refinement of the item files. One staff member estimated there would have to be at least 100,000 items in order to make the total system operational. Another staff member said the project would have to spend at least two full years with total concentration on the development and refinement of the item pool before it should be open for extensive use by classroom teachers. These staff personnel also suggested the emphasis should be on the development of test items rather than objectives and items because teachers do not currently think and function in terms of behavioral objectives. However, because of the potential for teacher use of the behavioral objectives in planning of instruction, they also felt the development of the behavioral objectives should not be totally discarded. In addition to providing a service for classroom teachers, the developmental staff identified other potentials for the project as its ability to support "expanded individualized instructional programs" and "expanded research into the importance of individual student characteristics in an instructional or testing setting."

Overall, the majority of the professional personnel exposed to the COMBAT system were positive in their reactions to the efforts of the past three years. Although the project was not successful in its efforts to attain wide development and wide use of the system in grade levels

four through twelve, in four subject areas, it has demonstrated that computer-based testing is a feasible and potentially useful instructional and research tool. In order to make the total system more fully operational and more able to meet its potentials, the greatest need is for a concentrated development and refinement effort to complete and upgrade the item files.

E. PERCEIVED EFFICIENCY OF THE PROJECT MANAGEMENT

The basic management structure of the COMBAT project was somewhat involved. The project was funded through Title III of the Elementary and Secondary Education Act. Prior to the initial funding, a number of agencies were involved developing the plans and proposal for the COMBAT project. The team members of the planning effort were staff members of Teaching Research in the Portland Public School District and school districts surrounding the metropolitan area, as well as members of the County I.E.D. offices from Multnomah, Clackamas, and Washington Counties. The Metropolitan Area Testing Program Board (MATPB) was an agency formed by the school districts in the three-county area. Because the COMBAT project was related to testing problems and ideas, it was decided to make the COMBAT project a part of the activities sponsored by the MATPB organization. The Multnomah County Intermediate Education District was designated as the fiscal agent for the COMBAT project. At the insistence of the governmental Title III agencies, a member of the staff from the Multnomah County I.E.D. was named project director. The major developmental work for the COMBAT project was subcontracted by Multnomah County I.E.D. to two other agencies. Teaching Research, a Division of the Oregon State System of Higher Education, received the subcontract

to develop the test items and objectives to be stored in the item files and to effect the overall coordination of the technical aspects of the project, and to provide liaison with the Metropolitan Area Testing Board and the other agencies working with the COMBAT project. Portland Public Schools' Computer Center received a subcontract to develop the computer storage and retrieval system and to operate the COMBAT center for receiving and processing teacher requests.

This section of the evaluation report is centered on the efficiency of the project management as perceived by the participating agencies (the project director, representing Multnomah County I.E.D.; the personnel at the Portland Public Schools' Computer Center; the project personnel at Teaching Research; members of the COMBAT Advisory Board selected by the MATPB organization; and school district testing representatives to the MATPB group).

The personnel from the different cooperating agencies were asked how they were kept informed about the operations of the COMBAT project. The members of the COMBAT Advisory Board stated they were kept informed through regular Advisory Board meetings and meetings of the total MATPB organization. A representative of the developmental staff from Teaching Research was always present and presented a formalized report. All the representatives to MATPB, in responding to a questionnaire, indicated they received their information from reports by the director of the development activities during the meetings of the MATPB organization and through written communications from MATPB. All members of the Advisory Board and the respondents to the testing representatives' questionnaire indicated the needed information was always available for the asking. Two members of the Advisory Board pointed out some special communication

problems. One member of the Board said there needed to be better communication between the general MATPB organization and the COMBAT Advisory Board in relation to the overall needs of the MATPB group. A second member of the Board stated that although information regarding COMBAT was always available, the dissemination of information was not always effective because the testing representatives were not always present at the meetings. At times there were no more than 25 of the 70 representatives in attendance. He further commented that although the needed information was always available, the testing representatives seldom took the initiative to inquire about special concerns.

When the members of the Advisory Board were asked, "Was the general management strategy for the project clearly known by yourself and others who were involved with the project?" The majority of the Board responded "yes." One member of the Board reported "no management strategy was displayed." He indicated the "decision making responsibilities should have been more clearly defined." All members of the Board commented that slightly different strategies were employed by the county I.E.D. offices, Teaching Research, the MATPB organization, and individual school districts. They further identified the COMBAT Advisory Board as basically responsible for decision making regarding project operations, the Multnomah County Intermediate School District as the final authority for fiscal control, and Teaching Research development staff as initiators for planning and development of project activities. One member of the Advisory Board commented: "there appeared to be some misunderstanding about the project responsibilities of the development staff and the responsibilities of the Multnomah County I.E.D." One member of the Board indicated that he was unconcerned about the general management of the project.

When asked to describe their role as members of the Advisory Board, six of eight individuals reported they were a communication link between the teachers, Teaching Research, and the MATPB organization; while three individuals indicated they provided advice to the COMBAT staff and supported the activities of the staff.

When asked whether or not they were involved in project decision making, the majority of the members of the COMBAT Advisory Board reported that they were involved with all of the basic decisions regarding the COMBAT project operation. All of these Board members reported the project director and the director of the development staff were very agreeable as far as accepting the ideas and decisions of the Board and in taking steps to implement the ideas. Of the 14 district representatives responding to a questionnaire, nine indicated they were not directly involved in project decisions, four indicated they were involved, and one failed to respond. Three of the four "yes" responses were qualified as follows: "somewhat, participated in the original planning grant," "All policy decisions," and "Secondary, not in project development."

All members of the project staff at the Computer Center reported a lack of communication between the Computer Center and the MATPB organization. Three of the four staff members interviewed indicated they did not know what the MATPB organization was all about, or how the COMBAT project was associated with the organization. Although members of the computer staff found the general quality of communications between themselves and the developmental staff to be reasonable, they felt they should have been kept better informed about the relationships of the total project to the MATPB program, and felt that communications between themselves and the developmental staff could have been better. Two of

the primary reasons for some deficiencies in communications between the computer staff and the developmental staff were listed as the distance in mileage between the two organizations and the fact that few of the developmental staff had a thorough knowledge of the computer capabilities and operations. The members of the developmental staff said the communications between themselves and the MATPB organization were very good, but they also recognized the existence of some communications problems between themselves and the computer staff.

Members of the Advisory Board and the two technical staffs of the COMBAT project were asked to identify the most critical project decisions as they perceived them. The following responses were recorded from the COMBAT Advisory Board. "The decision to involve testing people instead of curriculum people was a mistake. If curriculum people would have been involved, it would have been a more solid funding base and a closer contact with teachers." Another comment was, "The decision on what area the initial item pool would cover and the program for input and output of data. The real problem was the COMBAT project was originally to be four or five years, but was cut to three years." A third member of the Board stated that, "The time to finally make the project operational was a critical decision." Another member reported, "They should have stayed with the fourth, fifth, and sixth grade social studies and not expanded to other areas"; and "enough money should have been budgeted to supply teachers for writing objectives and items." Another member of the Board stated, "Two critical decisions were the expansion of the item files and the use of teacher constructed tests as a source for items. Another Board member indicated the critical decision was "the change from fourth, fifth, and sixth grade social studies to a more broadly

defined area." This member felt that this decision was a "bad" in error.

Members of the developmental staff reported that, in their opinion, the most critical project decisions came initially with the choice to center the early work of the project with grades four through six in the social studies areas. They felt this decision made the initial work in the development of the system more difficult than if a higher grade level and a more well defined instructional program or curriculum area had been selected. Other critical decisions were identified as the move from periodic workshops for obtaining test items to the D.C.E. classes in the second year, and finally to the decision to edit items supplied by teachers from the tests teachers wrote.

The Computer Center personnel identified two major changes in the project operation as affecting the project. The first was the switch from a small to a large computer at the Portland Public Schools' Computer Center. The impact of this change resulted in increasing the cost of operating the COMBAT center. The other major change was identified as the switch in the output formats that were mailed to teachers of the result of their initial request. The latter decision was not a major problem however. One member of the Computer Center staff indicated a problem resulted from the decision to edit teacher constructed tests. Since college students were trained to edit and revise these items, the work of these individuals should have been checked more closely. This member of the staff indicated that much of the material sent to the Computer Center from the student item-editors contained several mistakes, such as spelling, grammar, and punctuation. This staff member identified the extistence of these poorly constructed items as a crucial weak point in the system. Although efforts were made to identify and correct

erroneous or poorly constructed test items, the procedures were not adequate to completely refine all of the items.

In response to the question, "Did any special circumstances and/or constraints either help or hinder the operations of the COMBAT project?" 6 respondents to the district testing representatives' questionnaire indicated "yes," two indicated "no," and six failed to respond. When asked to list those circumstances which helped the project, two of these people indicated that the "chairman was eager, enthusiastic, and built enthusiasm," and one representative indicated the "increased utilization when teachers were asked to submit their own test items" for the item bank. Other comments were "The exchange of ideas with other districts needed in getting more needed items, the project director assuming a more appropriate role as director not just fiscal agent, dinners for teachers who might use or encourage the use of the system." One representative indicated he had been on the Board only for one year and couldn't make a value judgment. When asked to list those circumstances which hindered the project management, the following responses were recorded: Three representatives identified the lack of funds for teachers to develop materials, two identified the reluctance of teachers to accept the project, two identified poor communications between the districts and COMBAT, and "COMBAT's overstating its ability to perform," "the program was not used by the extremely wide geographic area to be covered" "the distance between the management and this area," "the superintendent did not understand and was opposed to it," "index was distributed too late," and "the request that the tests used by teachers be returned to Teaching Research for item analysis discouraged teachers from using the system."

When the members of the COMBAT Advisory Board were asked, "What special circumstances and/or constraints either helped or hindered the operation of the COMBAT project?", the following responses were recorded: "One hindrance to the project was the political interplay between the Intermediate Education Districts and the individual school districts, but COMBAT had no constraints," "it helped to let the teachers know the system was developmental and not operational when they were writing items and objectives, because some teachers didn't see the need for this activity if it was going to be operational at the beginning," "the human resources and the organization involved were the most valuable in helping to implement COMBAT," "newness of the idea and the limited curricular areas probably hindered the project," "it is hard to sell an idea when teachers aren't interested in a service," "cutting of the funds by the national funding agency" "Division of Management, the I.E.D., who was supposed to be the director but was nothing more than a name on a piece of paper for the first year. The Advisory Board did not function in the capacity to the extent they should have," "the main hindrance was communication between the MATPB organization and the population of teachers and administrators given the matter of planning."

The members of the Computer Center staff indicated the major hindrance to project operation was the difficulty in obtaining feedback from classroom teachers regarding the quality of the items they received from the COMBAT center. They indicated it was difficult to attempt to refine the items in the system when teachers did not consistently respond to requests for their reactions to the items they received. The member of the developmental staff identified the major problems as the distance between the major subcontracting agencies and the time it takes to get

from one to the other. They indicated that it was hard to maintain communications between these two agencies. However, they indicated that communication with the MATPB organization was good because the Advisory Board meetings always immediately proceeded the general board meetings, and because of this "all of the right people were there at one time." Another problem identified by the developmental staff were changes in personnel within the developmental effort. The project would have been more efficiently operated if there had been a single major director of this activity over the full three years. One staff member of the developmental group indicated that most of the money from the subcontract let to the Computer Center went for salaries, while most of the computer time was donated to the project. This condition lowered the priority on computer time that was given to the COMBAT project.

The questionnaire designed for school district representatives to the MATPB organization included two questions that asked them to rate the project management. The first asked each representative to rate the degree of efficiency of the project management on five basic scales. In response to the first scale, consulting with MATPB representatives; three of fourteen rated efficiency as very low, one rated it as low, three rated it as average, four as high, and three failed to respond. In response to: use of teachers for system development; four rated the efficiency as low, four as average, three as high, and three failed to respond. On the scale, use of computer facilities; four representatives rated it average, five rated it high, and five failed to respond. On the scale, use of project staff; three representatives rated the efficiency low, five average, two high, and five failed to respond. On the scale, use of budgeted financial resources; four representatives rated

the project as average, three as high, and six failed to respond. Two of the fourteen representatives volunteered a low or very low rating for the project management on public relations with school districts.

The second rating item asked the district representatives to "generally rate the project management on effectiveness and efficiency". Of the fourteen representatives who returned the questionnaire, five rated the effectiveness as low, five as average, one as high, and three failed to respond. On efficiency, three rated low, five average, two high, and four failed to respond. In general, these reponses indicate the district representatives were not overly impressed with the general management of the project. The representatives seemed to be particularly concerned with the ability of the project staff to communicate and interact with the teachers and other professional staff in individual school districts.

The members of the Advisory Board were asked to rate the use of project resources, i.e.; the use of the Advisory Board, the use of teachers and other school district personnel, staff time, and financial resources. Five members of the Advisory Board commented in response to this question. Four rated the use of the Board's time as high and one rated it average. In response to; the use of teachers and other school district personnel; three members rated the project as high or average, while two individuals rated this item as low. Four of five members of the Advisory Board rated the use of staff time as high and one individual rated it as average. All but one of the members of the Advisory Board declined to rate the project management on the use of financial resources because they were not involved with the financial aspects of the project. The one member of the Advisory Board that did comment rated the use of available financial resources as high. Another individual declined to rate the use

of financial resources, but indicated that he would like to have redirected the first and second year so that the staff and computer time would have been used for the production of high quality materials. Members of the Advisory Board were also asked to generally rate the project management on effectiveness and efficiency. Seven members of the Board responded to this question. Four individuals rated the project management high and three rated it as average on both effectiveness and efficiency.

Overall, most of the people involved with the COMBAT project tended to rate the management of the project in the average range. However, there was some fluctuation with the rating depending upon the aspect of the management being discussed. Project management was rated lowest in its efforts to work with individual school district personnel in developing the item pool. The basic problem existed with public relations and general communications between researchers and practitioners. The literature in educational research shows this type of communication problem to be consistently present when researchers and practitioners collaborate on a development project. The data indicates that the COMBAT project was not able to bridge this gap any better than the majority of projects that require the cooperation of researchers and practitioners. As far as the technical competencies are concerned, the project management and operations tended to be rated slightly better than average. That is, the technical competencies of the computer staff and the development staff at Teaching Research were not questioned. Part of the problem may have been the shifting of staff on the developmental team. The shift in project personnel caused some communication problems between the developmental staff at Teaching Research and the staff at the Computer

Center. It also caused some communications problems between the developmental staff and the MATPB organization. However, this latter problem was small.

The project decision that received most comment by people in all of the agencies involved with the project was to attempt implementation before the item pool was fully developed. Several individuals identified this decision as leading to teacher dissatisfaction with what they obtained from the system. It appears that most teachers expected the system to be completely developed before it was disseminated for implementation. This misunderstanding led to dissatisfaction and frustration in teachers. The majority of personnel involved in the project have indicated that to make the project more functional, the major emphasis should be upon the development task. That is, the item pool needs to be greatly expanded and refined in order to make the system more functional for classroom teachers.

IV. INTERPRETIVE SUMMARY OF FINDINGS

A. CONGRUENCY BETWEEN OBJECTIVES AND OUTCOMES

At the end of a three-year period the COMBAT project was able to generate 32,163 test items and objectives. It is not known how many different specific instructional objectives were included in this list. For each test item in the item pool there was a corresponding instructional objective. However, some objectives had more than one test item associated with them. Although a large number of items were identified, the project was not able to identify instructional areas for all elementary and secondary curricular areas at all grade levels. Although many items and objectives were identified for grade levels four through twelve in Social Studies, Language Arts, Mathematics, and Science, teachers were not satisfied with the breadth and depth of the item pool

Although the Computer Center was successful in designing a storage and retrieval system that does function, there is a high cost for production of teacher requests of list of test items and test dittos. The telephone-mail system designed to serve as a communication link between the teachers and the COMBAT center appears to function well and to be well received by teachers. In the opinion of the personnel at the Computer Center, it would be difficult for teachers, with access to terminals, to use the present system for retrieving test items directly because of the knowledge of computer language required to search the files. This latter reason is also justification for the telephone communication system.

The findings of this evaluation indicate that in-service programs to train teachers in use of the COMBAT system were insufficient for the needs of the large service area included in the target population of the project. There is little direct evidence that the COMBAT project had any impact on the overall effectiveness of instruction in the curricular areas for which objectives and test items were prepared. Although the majority of teachers who responded to a questionnaire indicated that the COMBAT system made no change in their instructional programs, a small percentage indicated that it had some impact on the frequency of testing and the degree to which they planned instruction for specific objectives.

Although numerous methods for disseminating information to the teachers in the service area were attempted, there are large numbers of teachers in the service area who were not informed about the COMBAT project. Dissemination of information to classroom teachers is consistently a problem with innovations in education. This is especially true when the innovation is initiated from outside of the school district and the administrative personnel within the district are not directly involved in the project. Procedures to overcome the problems associated with information dissemination under such circumstances were not completely overcome by the COMBAT project.

During the third year of the project the staff were successful in expanding the item files by over twenty thousand objectives. They also reached their objective to expand the number of schools who had one or more teachers using the COMBAT system from 79 to 150 elementary schools and to introduce the COMBAT system to at least half of the secondary schools. The records indicate that the staff was able to

get at least one teacher in almost every secondary school in the service area to attempt to use the COMBAT system at least once. However, the number of teachers that used the system was limited. In all, a total of 470 teachers were recorded as having used the system by mid-spring, 1970. The majority of these teachers made only one or two requests and seldom if ever made a second request for the production of a test ditto.

The developmental staff were successful in producing an index of key words for distribution to teachers in the four content areas at the different grade levels. However, of the teachers who had used the system, less than 20 percent reported they had seen a copy of this index. There was an apparent breakdown in the procedures for distributing these documents from the developmental staff through the county I.E.D. offices to the school district offices and eventually to individual school buildings and teachers.

B. CONTINGENCY RELATIONSHIPS WITHIN PROJECT OPERATIONS AND OUTCOMES

The most critical relationship between the project operation and outcome was identified as the degree of development that is needed before teachers will use the system. There is evidence to support the notion that the majority of teachers were thinking of the COMBAT system as completely developed rather than an emerging testing system. When teachers attempted to use the system and found it was not totally operational at all levels they were discouraged from further use. Part of this discouragement can be attributed to what some members of the MATPB organization called "overselling" of the project to the teachers. It is strongly recommended that for future development of projects similar

to COMBAT that development be more fully completed before an attempt is made to obtain wide usage by classroom teachers.

There is also some evidence that operation of the project could have been improved if project personnel had not been changed. That is, if there had not been as many changes in the personnel assigned to the project in the developmental center at Teaching Research. A yearly change in project directors for the developmental effort caused some communication problems with the computer staff and with the general continuity of the total project.

C. SPECIAL PROBLEMS RELATED TO PROJECT CONTEXT

The large size of the area serviced by the COMBAT project presented some special problems to the project. These problems include the extremely diversified instructional objectives and/or strategies used by the many different school districts and a large number of teachers for the specified curricular areas and grade levels to which the project was directed. With the time and money resources, it was not possible to adequately identify all of the instructional objectives and develop appropriate test items. Another special problem related to the size of the service area was the physical capacity for the project staff to interact with key people in each of the seventy school districts and over three hundred school buildings. This circumstance led to special problems in dissemination of information and in the training of key personnel in each district. The COMBAT project was a function of the MATPB organization, but there is an indication that few districts identified the COMBAT project as a part of the MATPB program. Although many districts heavily supported the project, there is an indication that several school

districts did not understand the purpose or nature of the COMBAT project and therefore did not identify with it.

V. GENERAL CONCLUSIONS

In general it can be concluded that the COMBAT project was moderately successful. The project demonstrated that a computer-based testing system can be built, but failed to demonstrate it as an effective and useful tool by classroom teachers for improving classroom instruction.

The demonstration of the technical feasibility of a computer-based testing program is a significant contribution to the field of education. However, with the present storage and retrieval system the cost of retrieving lists of items and the cost of producing test dittos for teachers remains markedly high. These costs can be reduced with the present system by increasing the number of teachers who make use of the system. In spite of this potential for reducing the cost for retrieving items, it is strongly recommended that the Computer Center investigate alternative strategies for retrieving materials stored in the item pool. In general, teachers are satisfied with the telephone-mail communication system between themselves and the Computer Center. This system appears to function well.

Teachers tend to be satisfied with the test items and objectives that are stored in the system, but indicated a dissatisfaction with the diversity and coverage that were developed in the three-year period. This dissatisfaction could have been overcome if the project would have limited its efforts to a smaller curriculum area. The project would probably have been able to more adequately demonstrate the utility of the system for classroom teachers and its impact upon instruction if such an alternative procedure had been followed. The decision to expand

the grade levels from four through six to four through twelve, and from one curricular area to four curricular areas, spread the developmental staff too thin. Not enough materials could be developed in each of these areas to make the system satisfactory to enough teachers.

Before the present system can demonstrate its effectiveness as an instructional tool and an aid to classroom teachers, the item pool will have to be greatly expanded. This means that the item pool will have to be enlarged by three to four times its present number. In addition, the system should be refined by working through small groups of selected teachers rather than through the general teacher population in a given geographic area. On the whole, teachers expect projects to be fully developed before they are asked to become involved except under very special circumstances. Teachers that are involved in the development and refinement efforts will probably have to be financially reimbursed for their work.

There were some communication problems within the various agencies included in the COMBAT project. Two major communication problems existed. One of these was the dissemination of information from the project staff to teachers at each school building. The task was too large to be adequately handled by the project staff itself, and the delegation of communication responsibilities through the hierarchy of educational institutions did not operate effectively. Second, there were some communication problems between the developmental staff and the staff at the computer center. Part of these problems resulted from the staff turnover within the developmental group and because the developmental staff did not always have a working knowledge of computer systems.

Although it might not be entirely necessary for the developmental staff to have a knowledge of the computer systems, the computer staff in the present project indicated that this condition caused some problems in communication.

The management of the technical aspects of the project were generally rated as better than average. However, because of the inability of the project staff to get a large proportion of teachers to consistently use this system, the management tended to be rated somewhat lower on effectiveness. From a post hoc position, members of the MATPB COMBAT Advisory Board and school district representatives to the MATPB organization questioned the project decision to expand the project target population. Some members of the MATPB organization questioned the effectiveness of the developmental staff in working with school district personnel. This latter comment is not unique to the COMBAT project. The literature of educational research consistently reports the problems of communication that exist when researched and practitioners cooperate on developmental projects.

Personnel from all of the agencies that cooperated on the COMBAT project were consistent in their agreement with the potential power for the concept being explored by the COMBAT project. These professional educators all agreed that once the concept is more fully developed and refined that it will make a significant contribution to Education.

APPENDICES

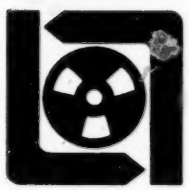
Appendix A

System User Questionnaire

A Title III Project

COMPUTER BASED TEST

Development Center



COMBAT Evaluation Questionnaire

Form I

Evaluation Unit

TEACHING RESEARCH

a Division of the Oregon State System of Higher Education

Monmouth, Oregon

COMBAT USERS' QUESTIONNAIRE

1. What is the grade level of the majority of the students you teach?

- ☐ 1 - 3
- ☐ 4 - 6
- ☐ 7 - 9
- ☐ 9 - 10
- ☐ 11 - 12
- ☐ 9 - 12

2. Check the box which best describes your major teaching assignment?

- ☐ Self-contained
- ☐ Science
- ☐ Mathematics
- ☐ Social Studies
- ☐ Language Arts (not a foreign language)
- ☐ Other (please specify:_____)

3. What is your age?

- ☐ 20 - 30
- ☐ 31 - 40
- ☐ 41 - 50
- ☐ 51 - 60
- ☐ 61 - over

4. Sex

- ☐ Male
- ☐ Female

5. Which of the following best describes the grade levels included in your school?

- ☐ 1 - 6
- ☐ 6 - 8
- ☐ 7 - 9
- ☐ 10 - 12
- ☐ 9 - 12

6. Which of the following best describes your present level of college training in terms of degree and term (quarter) hours?

- ☐ Bachelor degree
- ☐ Bachelor + 20 Hrs.
- ☐ Master's or Bachelor + 45 Hrs.
- ☐ Master's + 20 Hrs.
- ☐ Master's + 45 or more Hrs.

7. How many times have you requested a list of test items from the COMBAT system?

- ☐ 0
- ☐ 1 - 2
- ☐ 3 - 4
- ☐ 5 - 6
- ☐ 7 or more

8. Approximately what percent of your total classroom testing could be done with test items obtained from the COMBAT system?

- ☐ 0 - 20%
- ☐ 21 - 40%
- ☐ 41 - 60%
- ☐ 61 - 80%
- ☐ 81 - 100%

9. Indicate your general rating of the list(s) of test items you have received on each of the following criteria.

Difficulty	☐ Very Hard	☐ Hard	☐ About right	☐ Easy	☐ Very Easy
Range of Content	☐ Very Similar	☐ Similar	☐ About right	☐ Diverse	☐ Very Diverse
Range of Item Style	☐ Very Similar	☐ Similar	☐ About right	☐ Diverse	☐ Very Diverse
Clarity	☐ Very Ambiguous	☐ Ambiguous	☐ Clear	☐ Very Clear	

10. If you have ever requested both objectives and associated test items, RATE the appropriateness of the test items for the associated objectives.

☐ Very low

☐ Low

☐ About 50% appropriate

☐ High

☐ Very High

☐ Never requested both

11. How did the COMBAT system change your classroom instruction in each of the following areas:

Quality of tests	☐ Much Worse	☐ Worse	☐ No Change	☐ Better	☐ Much Better

11. (Continued) How did the COMBAT system change your classroom instruction in each of the following areas:

	Much Less Often	Less Often	No Change	More Often	Much More Often
Frequency of testing	☐	☐	☐	☐	☐
Frequency of pre-testing	☐	☐	☐	☐	☐
Plan tests related to specific objectives	☐	☐	☐	☐	☐
Plan instruction for specific objectives	☐	☐	☐	☐	☐
Used tests in new ways	☐	☐	☐	☐	☐
Used objectives in new ways	☐	☐	☐	☐	☐

	Much More Time	More Time	No Change	Less Time	Much Less Time
Time required for test construction	☐	☐	☐	☐	☐

	Much Larger Group	Larger Groups	No Change	Smaller Groups	Much Smaller Groups
Size of group tested	☐	☐	☐	☐	☐

12. Which of the following best describes what you did with the list of test items received from the COMBAT center?

☐ Did not use the test items with students

☐ Selected a few items and added several of your own before preparing a test ditto

☐ Selected several items and added several of your own before preparing a test ditto

☐ Selected items only from the list and prepared your own test ditto

☐ Selected items only from the list and ordered a test ditto

13. How many times have you requested a list of objectives from the COMBAT system?

- ☐ 0
- ☐ 1 - 2
- ☐ 3 - 4
- ☐ 5 - 6
- ☐ 7 or more

14. RATE the appropriateness of objectives requested for your intended purpose.

- ☐ Very low
- ☐ Low
- ☐ About 50% appropriate
- ☐ High
- ☐ Very high

15. Has the COMBAT center always sent back the test items you selected for the final test?

- ☐ Yes
- ☐ No

16. How long did it take (in elapsed school days) for you to receive the list of test items.

- ☐ 1 - 2 days
- ☐ 3 - 4 days
- ☐ 5 - 6 days
- ☐ 7 - 8 days

17. How many times have you requested a final test (ditto form) from the COMBAT system?

- ☐ 0
- ☐ 1 - 2
- ☐ 3 - 4
- ☐ 5 - 6
- ☐ 7 or more

18. Please rate the formal or appearance of the final test according to the following criteria.

	Very high	High	Moderate	Low	Very low
Readable	☐	☐	☐	☐	☐
Language Understandable	☐	☐	☐	☐	☐
Form of Question that you approve of using	☐	☐	☐	☐	☐
Ease of Scoring Test	☐	☐	☐	☐	☐
Clarity of Symbols used (as appropriate)	☐	☐	☐	☐	☐

19. Please rate the test dittos you received on the following criteria:

	Very high	High	Moderate	Low	Very low
Ease of reading	☐	☐	☐	☐	☐
Economical use of space on page	☐	☐	☐	☐	☐
Dittos make adequate number of copies	☐	☐	☐	☐	☐
Dittos are compatible with machine at my school	☐	☐	☐	☐	☐

20. What changes in the print-out format for objectives and test items could you suggest that would make it (the print-out) more acceptable?

a. _____

b. _____

c. _____

d. _____

21. Please make one positive comment and one negative comment about the procedures for obtaining objectives, lists of test items and test matters.

Positive comment: _____

Negative comment: _____

22. Do you have access to the COMBAT COMPUTER-BASED TEST DEVELOPMENT INDEX for your grade level and subject area?

☐ Yes

☐ No

23. If you answered yes on number 22, rate the index on the following dimensions of usefulness as an aid in requesting lists of objectives and/or test items from the COMBAT system.

Usefulness:	☐ **not** useful	☐ of little use	☐ useful	☐ very useful	☐ essential	☐ don't know
Complexity:	☐ too complex to be used	☐ slightly complex	☐ complex	☐ not too complex	☐ very clearly written	☐ don't know
Comprehensiveness:	☐ too comprehensive	☐ slightly too comprehensive		☐ comprehensive	☐ just right	☐ don't know

24. Place a check in the box corresponding to each of the following items you have seen.

- ☐ COMBAT BROCHURE
- ☐ Telephone stickers advertising COMBAT
- ☐ COMBAT slide-tape presentation
- ☐ COMBAT article in the journal OREGON EDUCATION, December, 1970
- ☐ COMBAT presentation at O.E.A. State Convention, 1969
- ☐ Matchbooks advertising COMBAT
- ☐ COMBAT puzzles
- ☐ none of these

25. How do you rate your familiarity of the COMBAT SYSTEM?

- ☐ near zero
- ☐ low
- ☐ barely enough to use it
- ☐ moderate
- ☐ high

26. What was the approximate date of your LAST request from COMBAT?

- ☐ Sept. - Dec., 1968
- ☐ Jan. - June, 1969
- ☐ Sept. - Dec., 1969
- ☐ Jan. - May, 1970

27. If you have ordered one or more lists of objectives, which of the following best matches the reason(s) for your request?

- ☐ To experiment with the COMBAT system
- ☐ To use the objectives as a guide for planning instruction
- ☐ To search for new ideas for classroom instruction
- ☐ To use the objectives as a guide for ordering test items
- ☐ Other (specify)_____

28. How many times have you used COMBAT test items for:

	0	1	2	3	4 or more
A pretest	☐	☐	☐	☐	☐
A posttest	☐	☐	☐	☐	☐
A diagnostic test	☐	☐	☐	☐	☐
A special test designed for one student and a small group of students	☐	☐	☐	☐	☐

29. Approximately how often do you test, in your own instructional program, for each of the following purposes?

	Never	1 - 3 times/yr.	4 - 6 times/yr.	1 - 2 times/mo.	3 or more times/mo.
Pretest	☐	☐	☐	☐	☐
Posttest	☐	☐	☐	☐	☐
Diagnostic test	☐	☐	☐	☐	☐
To check on instructional effectiveness but not to grade students	☐	☐	☐	☐	☐

30. What would be the <u>ideal</u> number of school days between the day you order a list of test items and the day you receive the list?

☐ 0
☐ 1
☐ 2
☐ 3
☐ 4

31. What would be the <u>maximum</u> number of school days that can elapse between the day you order a list of test items and the day you receive the list?

- ☐ 0 - 1
- ☐ 2 - 3
- ☐ 4 - 5
- ☐ 6 - 7
- ☐ 8 or more

32. Approximately what percent of your student grading or evaluation is based on tests composed of items like those stored in the COMBAT system?

- ☐ 0 - 20%
- ☐ 21 - 40%
- ☐ 41 - 60%
- ☐ 61 - 80%
- ☐ 81 - 100%

33. Please rank the following possible uses for the COMBAT system in order of importance. The most important should be rated one (1) and the least important six (6).

- ☐ Facilitate daily testing by classroom teachers.
- ☐ Facilitate systematic curricular revisions.
- ☐ Provide feedback for students on their current level of learning (achievement).
- ☐ Facilitate district wide assessment of learners and the educational program.
- ☐ Enhance the teacher's role as "instructional manager."
- ☐ Test the effectiveness of specific instructional methods or materials.

34. Place a check in the box corresponding to each of the following activities in which you participated.

- ☐ COMBAT teacher workshop - Summer, 1968 (Writing obj., etc.)
- ☐ COMBAT initial experimental trials - Fall, 1968
- ☐ Department of Continuing Education workshop measuring Educational Objectives - Fall & Winter, 1968-69
- ☐ Building or district level COMBAT orientation meeting - Fall & Winter, 1969-70
- ☐ COMBAT teacher advisory team dinner - October, 1969.

35. What do you perceive as the major strength of the COMBAT system?

_____

_____

_____

36. What do you perceive as the major weakness of the COMBAT system?

_____

_____

_____

37. What other services would you like to see made available from the COMBAT center?

a. _____

b. _____

c. _____

d. _____

Appendix B

General Questionnaire

A Title III Project

COMPUTER BASED TEST

Development Center

COMBAT Evaluation Questionnaire

Form II

Evaluation Unit

TEACHING RESEARCH

a Division of the Oregon State System of Higher Education

Monmouth, Oregon

COMBAT
General Questionnaire

1. What is the grade level of the majority of the students you teach?

- ☐ 1 - 3
- ☐ 4 - 6
- ☐ 7 - 9
- ☐ 9 - 10
- ☐ 11 - 12
- ☐ 9 - 12

2. Check the box associated with the best description of your major teaching assignment.

- ☐ Self-contained
- ☐ Science
- ☐ Social Studies
- ☐ Mathematics
- ☐ Language Arts (not foreign language)
- ☐ Other (Specify) _____

3. What is your age?

- ☐ 20 - 30
- ☐ 31 - 40
- ☐ 41 - 50
- ☐ 51 - 60
- ☐ 61 - over

4. Sex:

☐ Male

☐ Female

5. Which of the following best describes the grade levels included in your school?

☐ Bachelor degree

☐ Bachelor + 20 hours

☐ Master's or Bachelor + 45 hours

☐ Master's + 20 hours

☐ Master's + 45 hours or more

6. Which of the following best describes the grade levels included in your school?

☐ 1 - 6

☐ 6 - 8

☐ 7 - 9

☐ 10 - 12

☐ 9 - 12

7. How often do you test in your classroom? (Check each appropriate category.)

☐ After each individual instructional unit

☐ After each MAJOR instructional unit

☐ Daily

☐ Weekly

☐ Monthly

☐ Quarterly

☐ As it seems appropriate

☐ Each grading period

8. Why do you give tests to your students:
(Check each appropriate category.)

- ☐ To plan instruction
- ☐ For grading and reporting student progress
- ☐ To monitor student progress
- ☐ To diagnose student weaknesses
- ☐ To provide guidance for students' individual study
- ☐ To motivate study (both group and individual)

9. a. Do you mainly obtain test items from the information contained in your instructional materials, such as text books, films, recordings, etc.?

- ☐ Yes
- ☐ No

b. If YES, do you use items:

- ☐ Prepared by the textbook publisher?
- ☐ Write your own items?

10. a. Do you use any special references in constructing tests, such as lists of test items?

- ☐ Yes
- ☐ No

b. If YES, please name one such reference.

_____

11. Place a check in the box corresponding to each of the following items you have seen.

- ☐ COMBAT Brochure
- ☐ Telephone stickers advertising COMBAT
- ☐ COMBAT slide-tape presentation
- ☐ COMBAT article in the journal OREGON EDUCATION, December, 1970

11. (Continued) Place a check in the box corresponding to each of the following items you have seen.

- ☐ COMBAT presentation at O.E.O. State Convention, 1969
- ☐ Matchbooks advertising COMBAT
- ☐ Copies of COMBAT test items or test ditto masters
- ☐ None of these

12. Approximately how often do you test for each of the following purposes?

	Never	1-3 times/yr.	4-6 times/yr.	1-2 times/mo.	3 or more times/mo.
Pretest	☐	☐	☐	☐	☐
Post-test	☐	☐	☐	☐	☐
Diagnostic test	☐	☐	☐	☐	☐
To check on instructional effectiveness but not to grade students	☐	☐	☐	☐	☐

13. In order to make a testing service most effective what would be the ideal number of school days between the day you order a list of test items and the day you receive the list? (For any test purpose.)

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4

14. What would be the maximum number of school days that can elapse between the day you order a list of test items and the day you receive the list?

- ☐ 0 - 1
- ☐ 2 - 3
- ☐ 4 - 5
- ☐ 6 - 7
- ☐ 8 or more

15. Where is the nearest phone, at school, that you can use to call the COMBAT center?

- ☐ Your office
- ☐ Department office
- ☐ Teacher's lounge
- ☐ School secretary's office
- ☐ Principal's office
- ☐ Public pay phone
- ☐ Other (Specify) _____

16. How easily available is this phone?

- ☐ Easily available
- ☐ Fairly convenient
- ☐ Moderately inconvenient
- ☐ Available but not convenient
- ☐ Unavailable

17. If you intended at this moment to call the COMBAT system for any reason, how easily could you locate the telephone number?

- ☐ I know exactly where the number is
- ☐ I think I know where I wrote it down
- ☐ I know who should have it
- ☐ I know who might have it
- ☐ I haven't the slightest idea who might have it

18. Place a check in the box corresponding to each of the following activities in which you participated.

- ☐ COMBAT teacher workshop - Summer, 1968
- ☐ COMBAT initial experimental trials - Fall, 1968
- ☐ Department of Continuing Education Workshop Measuring Education Objectives - Fall & Winter, 1968-69

18. (Continued) Place a check in the box corresponding to each of the following activities in which you participated.

- ☐ Building or district level COMBAT orientation meeting - Fall & Winter, 1969-70
- ☐ COMBAT teacher advisory team dinner - October, 1969

19. a. Have you ever requested test items from the COMBAT system?

- ☐ Yes
- ☐ No

b. If YES, approximately how many times?

- ☐ 1 - 2
- ☐ 3 - 4
- ☐ 5 - 6
- ☐ 7 - 8
- ☐ 9 or more

20. a. Have you ever used test items from the COMBAT system?

- ☐ Yes
- ☐ No

b. If YES, approximately how many times?

- ☐ 1 - 2
- ☐ 3 - 4
- ☐ 5 - 6
- ☐ 7 - 8
- ☐ 9 or more

Appendix C

Metropolitan Area Testing Program Board

Representative Questionnaire

A Title III Project

COMPUTER BASED TEST

Development Center

COMBAT Evaluation Questionnaire

Form III

Evaluation Unit

TEACHING RESEARCH

a Division of the Oregon State System of Higher Education

Monmouth, Oregon

COMBAT - MATPB questionnaire

Name:_____ Date:_____

School (school district):_____

Briefly describe your present district position (job):_____

_____

Job title:_____ Yrs. in this job:_____

Regarding The COMBAT System...

1. For future development of computer based testing programs, what do you think is the greatest potential use for:

   (a) objectives stored in the system? _____

   _____

   (b) test items stored in the system? _____

   _____

2. For future development of computer based testing programs, what are some of the ways the system could be manifested in the classroom?

   ____change in the frequency of testing
   ____testing for improvement of instruction
   ____teaching to specific objectives (for specific behaviors)
   ____more efficient-effective testing for grading purposes
   ____testing to describe the district
   ____testing to describe the children of the district
   ____testing to describe the instructional program of the district (behaviors which the program will elicit)
   ____other (please list):

   _____ _____

   _____ _____

3. What have you actually Observed about teachers and/or classrooms that illustrates the impact of the present COMBAT system?

_____

_____

_____

4. As a district representative to MATPB:

   (a) How were you informed about COMBAT operations?_____

   _____

   (b) Was this method of information transformation adequate?_____

5. Did any special circumstances and/or constraints either help or hinder the operation of the COMBAT project?

   ____ yes ____ no

   (a) List those circumstances which helped the project management.

   _____

   _____

   (b) List those circumstances which hindered the project management.

   _____

   _____

6. What were the most critical project decisions and how did the decisions affect the project?

   (a) project decision _____

   effects _____

   (b) project decision _____

   effects _____

   (c) project decision _____

   effects _____

7. Did you agree with the majority of the project decisions?

   ____ yes ____ no

   What were the consequences of these project decisions for you?

   positive _____

   negative _____

8. Were you involved in project decision-making?

____ yes ____ no

If yes, what types of decisions did you participate in making?

_____

Was your involvement: ____ by choice ____ by assignment

Would you have preferred: ____ more involvement in decision-making

____ less involvement in decision-making

9. Rate the efficiency of project management on the basis of its expenditure of the following resources by putting a check mark in the appropriate box.

	DEGREE OF EFFICIENCY				
	Very Low	Low	Average	High	Very High
(a) consulting with MATPB representatives	☐	☐	☐	☐	☐
(b) use of teachers for system development	☐	☐	☐	☐	☐
(c) use of computer facilities	☐	☐	☐	☐	☐
(d) use of project staff	☐	☐	☐	☐	☐
(e) use of budgeted financial resources	☐	☐	☐	☐	☐
(f) other	☐	☐	☐	☐	☐

10. The following list of activities were designed by the COMBAT staff to help develop test items and objectives and/or to stimulate use of the COMBAT system. Based on what you have OBSERVED, rate the effectiveness of each activity by checking the appropriate box.

	DEGREE OF EFFECTIVENESS				
	Very Low	Low	Average	High	Very High
(a) Summer, 1968-COMBAT teacher workshop for development of test items and objectives	☐	☐	☐	☐	☐
(b) Fall, 1968-COMBAT initial experimental trials in Social Studies for grades 4-6.	☐	☐	☐	☐	☐

10. Continued (Check the appropriate box)

	DEGREE OF EFFECTIVENESS				
	Very Low	Low	Average	High	Very High
(c) Fall & Winter, 1968-69 teacher workshops on Measuring Educational Objectives offered through the Department of Continuing Education	☐	☐	☐	☐	☐
(d) Fall & Winter, 1969-70 building and/or district level COMBAT teacher orientation meetings	☐	☐	☐	☐	☐
(e) October, 1969--COMBAT teacher advisory team dinners	☐	☐	☐	☐	☐

11. What other strategies might have been employed to increase the use of the COMBAT system in the participating schools?

_____

_____

12. The COMBAT staff used several additional means to distribute information about the COMBAT system and to build interest. For each item listed below, rate its effectiveness as a means of improving use of the system. Check the appropriate box.

	DEGREE OF EFFECTIVENESS				
	Very Low	Low	Average	High	Very High
(a) distribute COMBAT brochures	☐	☐	☐	☐	☐
(b) distribute telephone stickers advertising COMBAT	☐	☐	☐	☐	☐
(c) COMBAT slide-tape presentations	☐	☐	☐	☐	☐
(d) COMBAT article in OREGON EDUCATION December, 1969	☐	☐	☐	☐	☐
(e) COMBAT presentation at O.E.A. State Convention, 1969	☐	☐	☐	☐	☐

12. Continued (Check the appropriate box)

	DEGREE OF EFFECTIVENESS				
	Very Low	Low	Average	High	Very High
(f) distribution of matchbooks advertising COMBAT	☐	☐	☐	☐	☐
(g) distribution of COMBAT puzzles	☐	☐	☐	☐	☐

13. Generally, how do you rate the project management?

	Very Low	Low	Average	High	Very High
Effectiveness	☐	☐	☐	☐	☐
Efficiency	☐	☐	☐	☐	☐

List specific incidents, examples, problems, and/or decisions which contribute to your rating of the management.

_____

_____

14. Generally, how do you rate the total project?

	Very Low	Low	Average	High	Very High
Useful	☐	☐	☐	☐	☐
Important	☐	☐	☐	☐	☐
Significant	☐	☐	☐	☐	☐
Effective	☐	☐	☐	☐	☐
Feasible	☐	☐	☐	☐	☐

15. List one incident and/or example which illustrates your rating on each of the dimensions listed above.

Useful_____

Important_____

Significant_____

Effective_____

Feasible_____

Appendix D

Cover Letters for Questionnaires

TEACHING RESEARCH
A Division of the Oregon State System of Higher Education
MONMOUTH, OREGON 97361
Telephone (503)838-1220

May 18, 1970

Dear

The COMBAT project, sponsored by the Metropolitan Area Testing Program Board, is currently terminating its third year of operation. The federal program under which it has been funded, ESEA, requires that it be subjected to an independent evaluation at this time. This evaluation is to provide the United States Office of Education with information which may be used to make decisions about funding other such programs throughout the United States.

You were randomly identified, from among those persons who had used the COMBAT system, to assist us in this evaluative effort. We have purposely kept the sample size rather small, consequently, your responses to the instruments become extremely important. In effect, your response will serve as the opinion of eight teachers in the analysis process.

Will you please complete the attached instrument today? When completed, seal the instrument in its envelope, and return it to your principal.

Needless to say, your cooperation in this important effort is greatly appreciated.

Yours truly,

Frank Nelson

Frank G. Nelson, Director
Combat Evaluation Team

FGN/cj

The Oregon State System of Higher Education is composed of Oregon State University, University of Oregon, including the Medical and Dental School, Oregon College of Education, Southern Oregon College, Eastern Oregon College, Oregon Technical Institute, Portland State University, Division of Continuing Education and Teaching Research Division.

TEACHING RESEARCH
A Division of the Oregon State System of Higher Education
MONMOUTH, OREGON 97361
Telephone (503)838-1220

June 11, 1970

As you probably know, a requirement of all Title III projects is an independent or "third party" evaluation. The Teaching Research Evaluation Unit has contracted with the COMBAT project to fulfill this requirement.

Two purposes are being pursued in our evaluation efforts. First, we are attempting to gather information that will be useful in making future operations of COMBAT and similar projects more effective. Second, we need to provide information to the U.S.O.E. which will satisfy their "accountability" requirements. Your position as a district representative to MATPB makes you uniquely qualified to provide us with information which can serve both purposes.

We realize that you are very busy, but would appreciate a few minutes of your time to obtain answers to the attached questionnaire. Your response to each item is needed. If you feel that a specific question is not appropriate or applicable to your situation, we would like a brief explanation of why not. If you feel that any important aspect of the project evaluation, relating to your position as a district representative to MATPB, has been omitted please feel free to attach a written statement. These last two types of information will enable us to revise the evaluation design currently being employed.

Because of the late date, we need to receive your response as soon as possible. Please try to complete the questionnaire and return it in the enclosed self-addressed stamped envelope within the next two days.

Thank you very much for your assistance.

Sincerely

Robert R. Lange

Robert R. Lange
Asst. Director
COMBAT Evaluation Team

RRL/jkg

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TEACHING RESEARCH
A Division of the Oregon State System of Higher Education
MONMOUTH, OREGON 97361
Telephone (503)838-1220

May 18, 1970

Dear

The COMBAT project (Computer Based Test Development), sponsored by the Metropolitan Area Testing Board (MATPD), is terminating its third year of operation. The Teaching Research Division of the OSSHE has been engaged to evaluate the program according to the requirements of the United States Office of Education for projects funded under Title II, ESEA. The purpose of the evaluation is to determine to what extent the project met its original objectives. The evaluation will also provide information upon which the USOE may base future decisions regarding funding. We hope that the ultimate effect of a number of such evaluations will be to improve educational processes across the nation.

During the past three years COMBAT has developed a pool of instructional objectives and test items for the use of teachers in Clackamas, Multnomah, and Washington counties. The objectives and test items, prepared by teachers in these counties, have been stored in a computer at the Portland Public Schools Data Processing Center. Teachers in the area have been able to telephone the center and request both objectives and test items for use in their own classrooms. At this time, the item pool includes objectives and test items for Social Studies, Language Arts, Science, and Mathematics.

In the next few days, a sample of schools in the COMBAT service area will be receiving short questionnaires distributed and collected by the county IED offices. We need the aid of principals and teachers in your district in order to obtain the questionnaire data and appreciate any support you can give us. If for some reason the schools in your district are unable to complete the distribution of the questionnaires, we would appreciate your informing us as soon as possible.

Thank you for your cooperation.

Sincerely yours,

Frank Nelson

Frank Nelson, Director
COMBAT Evaluation Team

FN:nr

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TEACHING RESEARCH
A Division of the Oregon State System of Higher Education
MONMOUTH, OREGON 97361
Telephone (503)838-1220

May 18, 1970

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During the past three years COMBAT has developed a pool of instructional objectives and test items for the use of teachers in Clackamas, Multnomah, and Washington counties. The objectives and test items, prepared by teachers in these counties, have been stored in a computer at the Portland Public Schools Data Processing Center. Teachers in the area have been able to telephone the center and request both objectives and test items for use in their own classrooms. At this time, the item pool includes objectives and test items for Social Studies, Language Arts, Science, and Mathematics.

Your school has been selected by a random process, and we would appreciate your assistance very much. In a few days your county IED will distribute packages of questionnaires to each selected school; and it would be most helpful to us if you would distribute the questionnaires to all teachers in grades four and above. We would also appreciate your urging all teachers to complete the questionnaires and return them upon the next day, so that the IED can collect them on schedule.

Thank you for your cooperation.

Sincerely yours,

Frank Nelson

Frank Nelson, Director
COMBAT Evaluation Team

FN:bg

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TEACHING RESEARCH
A Division of the Oregon State System of Higher Education
MONMOUTH, OREGON 97361
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May 18, 1970

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During the past three years COMBAT has developed a pool of instructional objectives and test items for the use of teachers in Clackamas, Multnomah, and Washington counties. The objectives and test items, prepared by teachers in these counties, have been stored in a computer at the Portland Public Schools Data Processing Center. Teachers in the area have been able to telephone the center and request both objectives and test items for use in their own classrooms. At this time, the item pool includes objectives and test items for Social Studies, Language Arts, Science, and Mathematics.

Your school has been selected by a random process, and we would appreciate your assistance very much. In a few days your county IED will distribute packages of questionnaires to each selected school; and it would be most helpful to us if you would distribute the questionnaires to all teachers in the department which will be indicated in your package. We would also appreciate your urging all teachers to complete the questionnaires and return them upon the next day, so that the IED can collect them on schedule.

Thank you for your cooperation.

Sincerely yours,

Frank Nelson

Frank Nelson, Director
COMBAT Evaluation Team

FN:bg

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TEACHING RESEARCH
A Division of the Oregon State System of Higher Education
MONMOUTH, OREGON 97361
Telephone (503)838-1220

MEMORANDUM

TO: Principals in the COMBAT Evaluation Sample

FROM: COMBAT Evaluation Team, Teaching Research Division

DATE: May 18, 1970

Enclosed are the COMBAT questionnaires you have been expecting. Please distribute them to all teachers in grades four and above, and urge them to return the questionnaires as soon as possible. Each questionnaire should be returned to your office sealed by the teacher in the same envelope in which it comes.

Would you please return the large envelope containing the completed questionnaires to the county IED office by May 27, so that we may gather the questionnaires from IED offices by Friday, May 29.

We very much appreciate your efforts and the efforts of your teachers in behalf of the COMBAT evaluation.

Sincerely yours,

Frank Nelson

Frank G. Nelson, Director
COMBAT Evaluation Team

FGN:cj

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TEACHING RESEARCH
A Division of the Oregon State System of Higher Education
MONMOUTH, OREGON 97361

May 18, 1970

Dear Colleague:

The COMBAT project, sponsored by the Metropolitan Area Testing Board (MATPB), is currently terminating its third year of operation. The word COMBAT stands for Computer-Based Test Development. During the past three years the project has developed a pool of instructional objectives and test items for the use of teachers in Clackamas, Multnomah and Washington counties. The objectives and test items, prepared by teachers in these counties, have been stored in a computer at the Portland Public Schools Data Processing Center. Teachers in the COMBAT service area have been able to telephone the center and request both objectives and test items for use in their own classrooms. At this time, the item pool includes objectives and test items for Social Studies, Language Arts, Science, and Mathematics.

The United States Office of Education requires that all projects funded under Title II, ESEA, such as COMBAT, be subjected to an independent evaluation. The purpose of this evaluation is to determine if the project achieved its intended objectives and to provide the USOE with information needed for making decisions about funding future programs. The ultimate effect of a number of such evaluation efforts can significantly improve education throughout the United States.

Your school has been randomly identified, from among all the schools in the COMBAT service area, to assist us in this evaluation task. We have purposely kept the number of teachers involved as small as possible; consequently, your responses are extremely important. In effect, your responses will be treated as the opinions of many other teachers.

Would you please complete the attached instrument today? When you have finished, seal the instrument in its envelope and return it to your principal. He will see that it is delivered to us.

Your cooperation in this important effort is greatly appreciated.

Sincerely,

Frank Nelson

Frank Nelson, Director
COMBAT Evaluation Team

FN:bg